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DEVON & EXETER CLUB.

TRANSACTIONS
OF THE
DEVONSHIRE ASSOCIATION.

TRANSACTIONS
OF THE
DEVONSHIRE ASSOCIATION

FOR
**THE ADVANCEMENT OF SCIENCE, LITERATURE,
AND ART.**

1872.

VOL. V.

**PLYMOUTH:
WILLIAM BRENDON AND SON,
26, GEORGE STREET.**

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REPORT AND TRANSACTIONS

OF THE

DEVONSHIRE ASSOCIATION

FOR

THE ADVANCEMENT OF SCIENCE, LITERATURE,
AND ART.

[EXETER, JULY, 1872.]

840702

VOL. V. PART I.

**The Editor is requested by the Council to make it known to the Public, that
the Authors alone are responsible for the facts and opinions contained in their
respective papers.**

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OFFICERS.

1872-73.

President.

THE RIGHT REV. THE LORD BISHOP OF EXETER.

Vice-Presidents.

THE RIGHT WORSHIPFUL THE MAYOR OF EXETER.

THE HIGH SHERIFF OF EXETER.

SIR JOHN BOWRING, LL.D., F.R.S., &c. E. A. BOWRING, Esq., M.P.

SIR J. D. COLERIDGE, M.A., Q.C., M.P.

REV. PRECENTOR COOK, M.A. H. S. ELLIS, Esq., F.R.A.S.

REV. TREASURER HAWKER, M.A.

J. KENNAWAY, Esq., M.P. REV. CANON KINGSLEY, M.A., F.L.S., F.G.S.

SIR L. PALK, BART., M.P. E. PARFITT, Esq., M.B.S.

Gen. Treasurer.

E. VIVIAN, Esq., M.A., Torquay.

Gen. General Secretary.

REV. W. HARPLEY, M.A., F.C.P.S., Clayhanger, Tiverton.

Gen. Local Treasurer.

W. COTTON, Esq.

Gen. Local Secretaries.

REV. R. KIRWAN, M.A., F.S.A. G. W. ORMEROD, M.A., F.G.S.

E. PARFITT, Esq., M.B.S.

Auditors of Accounts.

E. APPLETON, Esq., F.I.B.A. G. E. HEARDER, Esq.

Council.

AMERY, J. S.
AMERY, P. F. S.
APPLETON, E. A.
BATE, C. SPENCE
BAYLEY, W. B.
BERRY, R. L.
BIDDER, G. P.
BOWRING, SIR JOHN
BOWRING, E. A.
BULLER, W. W.
CANN, W.
CHARLEWOOD, CAPT. E. P.
CHAMPERNOWNE, A.
CHANTER, J. R.
CLEMENTS, H. G. J.
COLERIDGE, SIR J. D.
COOK, F. C.
COTTON, R. W.
COTTON, W.
ELLIS, H. S.

EXETER, BISHOP OF
FOWLER, H.
FOX, S. B.
FROUDÉ, J. A.
FROUDÉ, W.
GAMLEN, W.
GILL, H. S.
HALL, T. M.
HAMILTON, A. H. A.
HARPLEY, W.
HAWKER, J. M.
HEARDER, J. N.
HINE, J. E.
HODGSON, W. B.
HUTCHINSON, P. O.
KENNAWAY, J.
KINGDON, A. S.
KINGSTON, C.
KIRWAN, R.
MACKENZIE, F.

MACKENZIE, J. I.
MARTIN, J. M.
ORMEROD, G. W.
PALK, SIR L.
PARFITT, E.
PARRY, J. A.
PENGELLY, W.
PHILLIPS, J.
PYCROFT, G.
RADFORD, W. T.
RISK, J. E.
ROWE, J. B.
RUSSELL, Rt. Hon. Earl
SCOTT, W. B.
SCOTT, W. R.
STEBBING, T. R. R.
VICARY, W.
VIVIAN, E.
WHITLEY, N.
WORTH, R. N.

RULES.

1. THE Association shall be styled the Devonshire Association for the advancement of Science, Literature, and Art.
2. The objects of the Association are—To give a stronger impulse and a more systematic direction to scientific enquiry in Devonshire; and to promote the intercourse of those who cultivate Science, Literature, or Art, in different parts of the county.
3. The Association shall consist of Members, Honorary Members, and Corresponding Members.
4. Every candidate for membership, on being nominated by a Member to whom he is personally known, shall be admitted by the General Secretary, subject to the confirmation of the General Meeting of the Members.
5. Persons of eminence in Literature, Science, or Art, connected with the West of England, but not resident in Devonshire, may, at a General Meeting of the Members, be elected Honorary Members of the Association; and persons not resident in the country, who feel an interest in the Association, may be elected Corresponding Members.
6. Every *Member* shall pay an Annual Contribution of Ten Shillings, or a Life Composition of Five Pounds.
7. Ladies only shall be admitted as Associates to an Annual Meeting, and shall pay the sum of Five Shillings each.

8. Every *Member* shall be entitled gratuitously to a lady's ticket.
9. The Association shall meet annually, at such a time and place as shall be decided on at the previous Annual Meeting.
10. A President, two or more Vice-Presidents, a General Treasurer, one or more General Secretaries, and a Council, shall be elected at each Annual Meeting.
11. The President shall not be eligible for re-election.
12. Each Annual Meeting shall appoint a local Treasurer and Secretary, who, with power to add to their number any Members of the Association, shall be a local Committee, to assist in making such local arrangements as may be desirable.
13. In the intervals of the Annual Meetings, the affairs of the Association shall be managed by the Council ; the General and Local Officers, and Officers elect, being *ex officio* Members.
14. The General Treasurer and Secretaries, and the Council, shall enter on their respective offices at the Meeting at which they are elected ; but the President, Vice-Presidents, and Local Officers, not until the Annual Meeting next following.
15. All Members of the Council must be *Members* of the Association.
16. The Council shall have power to fill any Official vacancy which may occur in the intervals of the Annual Meetings.
17. The Annual Contributions shall be payable in advance, and shall be due in each year on the day of the Annual Meeting.
18. The Treasurer shall receive all sums of money due to the Association ; he shall pay all accounts due by the Association after they shall have been examined and approved ;

and he shall report to each Meeting of the Council the balance he has in hand, and the names of such members as shall be in arrear, with the sums due respectively by each.

19. Whenever a Member shall have been three months in arrear in the payment of his Annual Contributions, the Treasurer shall apply to him for the same.

20. Whenever, at an Annual Meeting, a Member shall be two years in arrear in the payment of his Annual Contributions, the Council may, at its discretion, erase his name from the list of Members.

21. The General Secretaries shall, at least one month before each Annual Meeting, inform each *Member* by circular of the place and date of the Meeting.

22. *Members* who do not, on or before the day of the Annual Meeting, give notice, in writing or personally, to one of the General Secretaries, of their intention to withdraw from the Association, shall be regarded as members for the ensuing year.

23. The Association shall, within three months after each Annual Meeting, publish its Transactions, including the Rules, a Financial Statement, a List of the Members, the Report of the Council, the President's Address, and such papers, in abstract or *in extenso*, read at the Annual Meeting, as shall be decided by the Council.

24. The Association shall have the right at its discretion of printing *in extenso* in its Transactions all papers read at the Annual Meeting; but the copyright of a paper read before any Meeting of the Association, and the Illustrations of the same which have been provided at his expense, shall remain the property of the Author.

25. The Authors of papers printed in the Transactions

shall, within seven days after the Transactions are published, receive twenty-five private copies free of expense, and shall be allowed to have any further number printed at their own expense. All arrangements as to such extra copies to be made by the Authors with the printer of the Association.

26. If proofs of papers to be published in the Transactions be sent to Authors for correction, and are retained by them beyond four days for each sheet of proof, to be reckoned from the day marked thereon by the printer, but not including the time needful for transmission by post, such proofs shall be assumed to require no further correction.

27. Should the Author's corrections of the press in any paper published in the Transactions amount to a greater sum than in the proportion of twenty shillings per sheet, such excess shall be borne by the Author himself, and not by the Association.

28. Every *Member* shall, within three months after each Annual Meeting, receive gratuitously a copy of the Transactions.

29. The Accounts of the Association shall be audited annually, by Auditors appointed at each Annual Meeting, but who shall not be *ex officio* Members of the Council.

BYE-LAWS AND STANDING ORDERS.

1. In the interests of the Association it is desirable that the President's Address in each year be printed previous to its delivery.
2. In the event of there being at an Annual Meeting more Papers than can be disposed of in one day, the reading of the residue shall continue the day following.
3. The pagination of the Transactions shall be in Arabic numerals exclusively, and carried on consecutively, from the beginning to the end of each volume; and each volume shall hereafter terminate with that 'Part' which contains the 600th page.
4. The Honorary Secretary shall bring to each Annual Meeting of the Members a report of the number of copies in stock of each 'Part' of the Transactions, with the price per copy of each 'Part' specified; and such report shall be printed in the Transactions next after the Treasurer's financial statement.
5. The Honorary Secretary shall prepare and bring to each Annual Meeting brief Obituary Notices of Members deceased during the previous year, and such notices shall be printed in the Transactions.
6. All Life Compositions shall be funded in the names of Treasurer and Secretary.
7. The Secretary shall, within one month of the close of each Annual Meeting of the Association, send to each Member newly elected at the said Meeting a copy of the following letter :—

*Devonshire Association for the Advancement of Science,
Literature, and Art.*

Sir,—I have the pleasure of informing you that on the of July, you were elected a Member of the Association on the nomination of

The Copy of the Transactions for the current year, which will
VOL. V.

be forwarded to you in due course, will contain the Laws of the Association. Meanwhile I beg to call your attention to the following statements:—

(1) Every Member pays an Annual Contribution of Ten Shillings, or a Life Composition of Five Pounds.

(2) The Annual Contributions are payable in advance, and are due in each year on the day of the Annual Meeting.

(3) Members who do not, on or before the day of the Annual Meeting, give notice in writing or personally to the General Secretary of their intention to withdraw from the Association are regarded as Members for the ensuing year.

The Treasurer's address is—EDWARD VIVIAN, Esq., Woodfield, Torquay.—I remain, Sir, your faithful Servant,

Hon. Sec.

8. The reading of any Paper shall not exceed twenty minutes, and in any discussion which may arise no Speaker shall be allowed to speak more than ten minutes.

9. Papers to be read to the Annual Meetings of the Association must be handed, together with all Drawings to be used in illustrating, to the General Secretary at or before the first Meeting of the Council on the first day of the Annual Meeting; and all Rules and Standing Orders connected with Papers read to the Association shall be printed in the Annual Circular.

10. Papers communicated by Members for Non-members, and received by the Council, shall be placed in the Programme below those furnished by Members themselves.

11. Papers which have been accepted by the Council cannot be withdrawn without the consent of the Council.

12. The Council will do their best so to arrange Papers for reading as to suit the convenience of the authors; but the place of a Paper cannot be altered after the Programme is printed.

13. Papers which have already been printed *in extenso* cannot be accepted unless they form part of the Literature of a question on which the Council has requested a Member or Committee to prepare a report.

14. The Bye-Laws and Standing Orders shall be printed after the "Rules" in the Transactions.

THE REPORT OF THE COUNCIL,

As presented at the General Meeting, at Exeter, July 30th, 1872.

THE Council of the Association, in presenting their customary Report at the close of this the tenth year since the formation of the Association, have the pleasure of congratulating the Members on the continued and uninterrupted prosperity which this Association has enjoyed throughout the period of its existence. On this occasion, revisiting, after a lapse of ten years, the city wherein the first meeting was held and the Association commenced its labours, it is natural to compare the present state with the condition of the Association in the year 1862. The Council need only mention two facts to justify them in offering their congratulations ; namely, whereas at the beginning of the decade the number of Members was only 69, at the close of it that number had increased to 285 ; and whereas in the first year six Papers only were read and discussed, in the tenth year twenty-eight were offered and accepted by the Association.

The tenth annual meeting, held at Bideford, commenced on Tuesday, August 15th, and was presided over with singular appropriateness by the Rev. Canon Kingsley, who had rendered the locality famous by his celebrated *Westward Ho!* The Mayor and Town Council assembled in the Town-hall to formally receive the Members of the Association, in the presence of a large number of both ladies and gentlemen of Bideford and the neighbouring district. After a few words of welcome from the Mayor, the Town Clerk then read the following address :—

“ To the President and Members of the Devonshire Association,—We, the Mayor, Aldermen, and Councillors of the Borough of Bideford, desire to offer you a cordial welcome on the occasion of your visit to this Borough, especially as you are accompanied by the Rev. Canon Kingsley and J. A. Froude, Esq., both of whom are well known to us as friends

of Literature, Science, and Art, and as old residents in this neighbourhood, and hope that your visit will be an agreeable one, and that it will tend to promote the objects for which the Devonshire Association is formed."

The Honorary Secretary briefly acknowledged the address; after which the Mayor invited all present to the Bridge Hall to partake of his hospitality.

In the evening the outgoing President, J. A. Froude, Esq., resigned his office to the President-elect, who then proceeded to deliver his Introductory Address.

On Wednesday, the 16th, the Association met at 11 a.m., and commenced the reading and discussion of the following programme of papers:—

- | | |
|--|---|
| Sketch of the Ancient History of Bideford | <i>J. A. Parry.</i> |
| A History of Lundy Island | <i>J. R. Chanter.</i> |
| Notes on the Geology and Mineralogy of Lundy
Island, with some Remarks on its relation to the Mainland | <i>Townshend M. Hall, F.G.S.</i> |
| A Contribution to the Etymology of Dartmoor
Names | <i>C. Spence Bate, F.R.S.</i> |
| On the "Clitter" of the Tors of Dartmoor | <i>C. Spence Bate, F.R.S.</i> |
| The Fall and Restoration of the Cromlech at
Drewsteignton, in the county of Devon, 1862 | <i>G. Wareing Ormerod, M.A.,
F.G.S.</i> |
| On the Boring of Molluscs, Annelids, and
Sponges, into Rocks, Wood, and Shells | <i>E. Parfitt.</i> |
| On the Existence of Pre-Cretaceous Sponges | <i>W. Pengelly, F.R.S., &c.</i> |
| A Pre-Homeric Persian Tradition of Adam as
the First Navigator | <i>Rev. B. H. Cooper, B.A.</i> |
| The Rainfall on the St. Mary Church Road,
Torquay, during the seven years ending with December 31st, 1870 | <i>W. Pengelly, F.R.S., &c.</i> |
| The Rainfall in Devonshire in 1870, and in the five years ending with December 31st, 1870 | <i>W. Pengelly, F.R.S., &c.</i> |
| The Rainfall on the low lands of the Estuary of the Taw | <i>N. Whitley, F.M.S.</i> |
| Further considerations of the supposed influence of the Moon on the Rainfall | <i>W. Pengelly, F.R.S., &c.</i> |
| On the Valley of the Euphrates Railway | <i>Capt. Charlewood, R.N.</i> |
| Is the Cavern of Pridhamsleigh, near Ashburton, worth exploring? | <i>J. S. Amery.</i> |
| Notes on the Pre-historic Archaeology of East Devon. No. 4. | <i>Rev. R. Kirwan, M.A., F.L.S.</i> |
| On the Pre-historic Antiquities of Dartmoor | <i>C. Spence Bate, F.R.S.</i> |
| Notes on the Population of Devonshire | <i>A. H. A. Hamilton.</i> |
| Notice of the Firing at the Battle of the Alabama and Kersarge, off Cherbourg, being heard in Devon. 1864 | <i>G. Wareing Ormerod, M.A.,
F.G.S.</i> |

The <i>Hyperborean Island of Hekataios</i> (B.C. 500).	Rev. B. H. Cooper, B.A.
Is it Britain? The Greek Traveller's Testimony Illustrated by a Hieroglyphical Gold Coin of King Cymbeline, being an Astronomical Date	
Was Great Britain the <i>Island of the Hyperboreans</i> mentioned by Diodorus Siculus in the passage supposed to be quoted by Hecateus?	
On certain Instances of Concentric Lamination observed amongst Pebbles on the Northam Ridge	Townshend M. Hall, F.G.S.
On the Name "Britain" and the Phoenicians. (Communicated by C. SPENCE BATE.)	
The <i>Clycopes and Phaiakes of Homer</i>	Rev. Basil H. Cooper, B.A.
The Language of the Gods	Rev. Basil H. Cooper, B.A.
The Fauna of Devon. Part vii. The Cirripedia	E. Parfitt.
On a Second Fossil Elephant's Tooth found at Sidmouth	P. O. Hutchinson.
The Literature of Kent's Cavern. Part iii.	W. Pengelly, F.R.S., &c.

In the evening the Annual Dinner of the Association was held in a marquee erected in the garden of the New Inn, and was well attended. Canon Kingsley presided, supported by the ex-President, Mr. J. H. Froude, and the Mayor of Bideford, Mr. How.

On Thursday, the 17th, the reading of Papers commenced, at 10 a.m., in the Town-hall, and continued until 3 p.m., when, a meeting of the Council having been held, the proceedings of the Bideford meeting, which proved one of the most successful and agreeable in the annals of the Association, were brought to a close.

It having been resolved to hold the next meeting in Exeter, the following were elected officers for that occasion:—

President: The Right Rev. the Lord Bishop of Exeter.
 Vice-Presidents: The Right Worshipful the Mayor of Exeter; the High Sheriff of Exeter; Sir John Bowring, LL.D., F.R.S., &c.; E. A. Bowring, Esq., M.P.; Sir J. D. Coleridge, M.A., Q.C., M.P.; Rev. Precentor Cook, M.A.; H. S. Ellis, Esq., F.R.A.S.; Rev. Treasurer Hawker, M.A.; J. Kennaway, Esq., M.P.; Rev. Canon Kingsley, M.A., F.L.S., F.G.S.; Sir L. Palk, Bart., M.P.; E. Parfitt, Esq., M.E.S. Hon. Treasurer: E. Vivian, Esq., M.A., Torquay. Hon. Local Treasurer: W. Cotton, Esq. Hon. Secretary: Rev. W. Harpley, M.A., F.C.P.S., Clayhanger, Tiverton. Hon. Local Secretaries: Rev. R. Kirwan, M.A., F.S.A.; G. W. Ormerod, Esq., M.A., F.G.S.; E. Parfitt, Esq., M.E.S.

The Council have published the President's Address, together with the Papers read before the Association; also a

financial statement, a list of Members, and the Rules; and thus completed the fourth volume of the Transactions of the Association.

Copies of the Transactions, together with an Index to Vol. iv., have been forwarded to each Member and the following societies:—The Royal Society, Linnæan Society, Geological Society, Ethnological Society, Royal Institution (Albemarle Street), Devon and Exeter Institution (Exeter), Plymouth Institution, Torquay Natural History Society, Honiton Literary Institution, Barnstaple Literary and Scientific Institution, Bideford Farmers' Club, Royal Institution (Cornwall), and the Secretary of the South Devon Railway Company.

The Council thank the South Devon and the London and South Western Railway Companies for the facilities they afforded the Members of attending the meeting.

The Council congratulate the Members on the prosperous financial state of the Association, which will be seen by the Treasurer's Report below.

The Council cannot close this Report without again recording their satisfaction at the successful manner in which the first decade has terminated, and they hope that the second decade which is inaugurated to-day may be signalized by equally eminent results. The satisfaction with which they can look back on the progress of the past year is, unhappily, clouded by the recollection of many and great losses. The obituary list is unusually heavy, and contains in it the names of some of our oldest, most valued, and most distinguished Members. Brief notices of each will be found below.

Treasurer's Report of Income and Expenditure during the Year ending July 30th, 1872.

RECEIPTS.	PAYMENTS.
Balance in Treasurer's hand, August 16th, 1871	£ 3 9
Arrears of Annual Contributions for 1869-70	0 10 0
ditto 1870-71	2 0 0
Annual Contributions for 1871-72	107 0
ditto 1872-73	6 10 0
Life Compositions	30 0
Ladies' Tickets sold at Bideford	1 10 0
Interest on Deposit to June 30th, 1871	2 18 1
Sale of Transactions for 1862	0 3 0
ditto 1863	0 6 0
ditto 1864	0 12 0
ditto 1865	0 10 0
ditto 1866	0 12 0
ditto 1867	0 18 0
ditto 1868	0 19 6
ditto 1869	0 17 0
ditto 1870	0 19 6
Annual Contributions remaining unpaid for 1870-71	£190 8 10
ditto 1871-72	6 10 0
Postage and Carriage of Parcels	18 10 0
Printing Cards, Bills, and Circulars	£25 0 0
Stationery	2 19 6
Utting, for Illustrating "Transactions" (1871)	0 7 6
Cockrem, for Printing Receipt Forms	5 11 0
Wilson, for Printing Programmes	0 11 8
Honey, for Printing Bills	1 0 0
Hon. General Secretary, for Petty Expenses	0 16 0
Hon. Local ditto	6 6 4
Hon. General Treasurer ditto	2 13 7
Advertising in 1869	2 14 4
ditto 1870	0 11 0
ditto 1871	0 13 0
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W. HARPLEY,

Hon. Secretary.

PRESIDENT'S ADDRESS.

GENTLEMEN,—Associations for the promotion of science, when electing their presidents, sometimes choose friends of science, sometimes students of science. It is plain that the duties which the president in any given instance has to discharge will in some degree depend on the character which has thus fixed the choice on him for the time. A student of science, if appointed to the office to which you have done me the high honour of appointing me, will naturally take the opportunity to review the progress of scientific discovery and research during the preceding year, and especially in that particular branch of science of which he is himself a student. He will note the elucidation of phenomena previously unexplained, the observation of phenomena previously unobserved. He will point out the bearing of each new step that has been taken in any one science on the progress of science as a whole. He may perhaps endeavour to indicate the path by which it seems most probable that science will successfully advance. No such duty can be successfully discharged nor wisely undertaken by one who can only claim the far humbler rank of a friend of science. A skilful imitator, by a dexterous use of second-hand knowledge, may impose on the public and amuse the Association by a delusive appearance of broad views, by striking but shallow generalizations, by reviewing what he does not really know, and estimating what he is not competent to weigh. But I cannot think that addresses of this kind are of high value, or worthy of such an Association as yours. And I must ask you, therefore, to bear with me if I look at your work from the outside rather than from the inside, and speak not of its progress nor of its future, but of the reasons why men who cannot study science should do their best to befriend it, and of the hopes which it inspires in those who have not the opportunity to devote themselves to

its service, and perhaps too of the fears—some baseless, some not unfounded—which appear to attend it on its way.

It may seem that, in saying all this, I am forgetting the true title and purpose of this Association, inasmuch as it is not an Association for the promotion of science only, but of Science, Literature, and Art. But I have not really forgotten. I know the title of the Association, and I know that any contribution to either literature or art would be gladly welcomed and highly esteemed by all our members. Nevertheless it is not without reason that science stands first of the three in your title, because it is plain that such Associations as these can do much more for science than they can for either literature or art; and it is no less plain that even literature and art are approached by us on the scientific side. We may here investigate with hope of profit both the literature and the art of the past; examine their history; appreciate their value; investigate the laws which have governed, or are likely to govern, either the one or the other: we can hardly hope to do much towards the production of a great poem, or a masterpiece of painting. Literature and art must always be more individual than science; must depend more on individual inspiration, less on the combined efforts of many labourers. We may do something, no doubt, by this Association to promote the true appreciation of literature and art as well as of science. But the appreciation of literature is not itself literature, and the appreciation of art is not itself art; while the appreciation of science is, as far as it goes, itself science.

Now in speaking of the debt which we all owe to science, I do not intend to dwell long on those direct benefits which are the frequent subject of conversation everywhere, and which are greater and more striking in these days than ever before. Not that I undervalue them, or am prepared to contend that other benefits less direct are to be put above them. I cannot undervalue what has been done and still is done day after day to increase human comfort, to diminish human suffering, to promote human intercourse. There may be, there is, much evil mixed up with all this good. The increase of comfort for all implies an increase of luxury for the wealthy. The diminution of suffering may possibly bring with it very often a diminution of useful discipline, a consequent enfeebling of moral strength. The promotion of intercourse, though unquestionably the chief instrument of civilization, may stimulate restlessness, may discourage the quietness and calm which belong to true nobility of character. But these are only the drawbacks with which all human gain is always

weighted. In spite of them all, the gifts of scientific discovery are gifts from God, reasons for gratitude to the giver, talents for us to use in His service.

I do not undervalue them by any means ; but I care not to speak of them now, because it is probably very little that an Association like this can do towards bestowing on mankind such benefits as these. Speaking as a friend of science, I would rather dwell now on what seems to me to be the precise service that an Association like this can do for all, and that is to promote the spread of the scientific spirit.

The scientific spirit which is now steadily, and yet almost imperceptibly, penetrating into all human thought and feeling is one of the powers of the world. Let us consider what it is doing.

It is, in the first place, making its way into all education ; not only by demanding a place for the study of science side by side with the study of literature, but by profoundly modifying the study of literature itself, introducing new methods of teaching, new standards of judging, new aims in learning, and new results of all. Everywhere there is heard a demand that the young shall be taught to know the world in which God has placed them, and the laws by which that world is governed. And this demand, which catches the public ear at every turn, is nevertheless not so striking a proof to the observant mind of the steadily-increasing power of the scientific spirit as is given by the defence to which the older studies are everywhere driven in order to maintain their position. For it is becoming every day less and less possible to maintain for those older studies an attitude of calm superiority, only needing resolute self-assertion to put aside all attacks. The older studies are compelled to claim that they can train the growing faculties better, partly because of their own inherent aptitude, partly because of their superior methods. But when this claim is examined, it resolves itself, not entirely but very nearly, into a claim that the older studies are scientific studies, and their methods scientific methods.

The basis of this interesting controversy is, in fact, being shifted to a scientific ground. Both sides are gradually coming to this common starting-point, that science must be at the bottom of all teaching. And the question is no longer whether science is to be admitted, but which science is to be ranked highest. The defenders of classical studies were once disposed to maintain that classics were better instruments of education than science. But now they argue that classics are

as truly a science as physics or botany, with more valuable results, and with more scientific methods. The old distinction between scientific studies and other studies is gradually passing away, and by all careful thinkers has been already pronounced untenable. The study of man is as plainly a science as the study of matter ; the study of language as one of the phenomena of man as plainly a science as the study of heat one of the phenomena of matter. The student who devotes himself to the investigation of the uses of a Greek particle is as truly engaged in scientific study as he who examines the history and relations of a bit of chalk. A man who makes out the exact meaning of words uttered by a great teacher of ancient days is as really engaged in a scientific operation as the observer who examines the sun with his spectroscope. It is quite true that a false usage has for some time confined the word science to the study of material nature. But that usage is slowly but surely disappearing, and as it disappears the true character of the controversy on the proper subjects of instruction will become clearer.

And as the defenders of the classical studies maintain the scientific nature of their subjects, so are they learning to maintain the scientific nature of their methods. Compare for a moment the learner who is set down to analyse a chemical compound, and the learner who is set down to translate a difficult piece of Greek. Each has to resolve what is before him into its constituent elements. Each has to refer to the laws by which those elements are combined. Each is supplied in some way or other with the general principles of his study : chemistry in the one case, grammar in the other. Each is supplied with some characteristics or test by which he is to know the elements in his hands : the text-book of chemistry in the one case, the lexicon in the other. And, what is most important of all, though quite as often forgotten by the teacher in the one case as by the teacher in the other, the one final proof of success in the task in both cases is, that the learner shall have puzzled out the results for himself without being aided with any of those hints or indications which always seem nothing to any teacher who is not thoroughly master of his profession, but which in reality just make the difference between really learning and pretending to have done so. The two processes are at bottom identical, and it is an abuse of terms to call one method scientific and the other not. Or, listen again to the answer which any great classical teacher will make to a demand that he shall put science, as the word is now generally used, on a level with

classics in his school. He will often say that what he has seen of the teaching of science has not prepossessed him in its favour ; that, as far as his experience goes, the teaching of science consists to a great degree of exhibiting very good experiments, and giving very good explanations ; but that inasmuch as the boys have nothing to do but to listen, they appear to understand when they really do not understand at all, and they rapidly forget, because they have not thoroughly understood. Now when this answer is examined, to what does it amount, but to saying that the method often adopted in teaching the sciences of nature is not truly scientific ? For if there is one characteristic of a scientific method more important than another it is this, that the learner shall handle with his own hands, shall see with his own eyes, shall judge with his own mind, shall infer with his own intellect. And certainly, as things now are, this characteristic is more plainly to be seen in the teaching of classics than in the teaching of anything else. Even geometry is not always taught in this country by so scientific a method. Nothing is more common than to find teachers who believe that a boy has learnt geometry who can write out a proposition of Euclid correctly, although they have no idea how few of their pupils would be able to work out an exceedingly simple geometrical problem without some fatal blunder of principle. But no classical teacher would dream of pronouncing a pupil acquainted with syntax who had not, in writing many exercises, proved by his unfailing accuracy in the application of grammatical rules that he thoroughly knew the principles of grammar.

As this controversy goes on, I have no doubt that the old studies will hold their ground—not certainly as hitherto to the exclusion of all others, but certainly in a position of acknowledged pre-eminence. But they will only do so by submitting more and more to the scientific spirit, by confessing their scientific character, by acknowledging the supremacy of the laws of science. And in so doing they will be profoundly influenced, and their methods, though good already, will be much changed for the better, and though scientific already, will become more scientific yet. For the goodness of the methods used in teaching these subjects is accidental, the fruit of a healthy instinct gradually feeling its way through many generations ; unconsciously, not consciously scientific ; resting on excellent traditions, not on known principles. The classical teacher teaches scientifically, as M. Jourdain wrote prose, without knowing that he is doing so. Nor do I think

that it can be denied that in itself the study of material nature is from its simplicity better fitted to illustrate true scientific methods than the far more complex study of any of the human phenomena. All studies, and among them more especially classical studies, will improve their methods under the influence of that pervading scientific spirit which is now surely conquering them all.

For the distinction which I drew just now between conscious and unconscious scientific methods is one of prime importance. At all times, and in all stages of culture or barbarism, men will use scientific methods and processes more or less. They would cease to be men if they did not. For these methods and processes are inherent in human reason. And these methods and processes may be improved in successive generations by mere use, and brought to some degree of excellence. But as long as they are unconsciously and not consciously scientific, their improvement is irregular, uncertain, sometimes checked for a time altogether, sometimes replaced by actual deterioration. And throughout all their progress they are inevitably mixed up with much that is altogether unscientific. It is when these methods have become consciously scientific that improvement is sure and definite, and never retrograde. Then begins the steady and certain elimination of the unscientific traditions. Then, and not till then, can it be said that men are possessed with the scientific spirit. Then do they begin to look at knowledge as a whole, and to recognize the relation of its parts to one another. And it is in this sense that the scientific spirit is entering into education, and will assuredly succeed at last in remodelling it.

Now it will have been noticed that, in speaking of this controversy on the subjects and methods of education, I have left out of sight a very important consideration, which nevertheless constantly enters, and is held by the mass of men to be better entitled to decide the dispute than any other, and this consideration is, not the scientific character, but the practical utility of different studies. But I omitted this, not because it is not exceedingly important in itself, and deserving of careful thought and discussion, but because, in the only aspect of the controversy of which we can properly take cognizance here, it cannot be admitted at all. For scientific purposes utility must be distinctly put aside. The utility of a science for practical uses in life is a crown of glory to be worn if won, but never to be made the chief aim. Nothing is so fatal to the true scientific spirit as to make practical

results the measure of value and the direct aim of labour. To aim directly at practical results is always to mar the very results at which we aim. The largest benefits to mankind invariably come from science pursued for its own sake, without any reference whatever to those benefits. Such benefits bear to science the same relation that the highest and noblest pleasure ever bears to virtue, that is, to use the words of Aristotle, it is ἐπιγνόμενόν τι τέλος. To seek virtue for its own sake, brings with it the truest and worthiest pleasure. To seek virtue for the sake of the pleasure that it can bring, is to destroy the essence of the virtue, and to lose all chance of the pleasure. So also to study science for the sake of science will bring to mankind countless benefits; to study science for the sake of those benefits is to injure the science, and consequently to lessen the benefits. There may be very good reasons why education should be directed to secure practical and material results. But those reasons will certainly not find their force in the prevalence of the scientific spirit.

I pass on from education to life, and there, too, the quiet growth of this same scientific spirit is everywhere visible. Nothing is more marked than the increasing value which men give to knowledge for its own sake. However utilitarian the age may be, and in more than one aspect it is intensely utilitarian, the keenest interest is everywhere shown in branches of knowledge which not only have no immediate utility, but, moreover, give no promise of any. How keenly do men listen to the remarkable discoveries made of late years by the use of the spectroscope! It is difficult to imagine how any material benefit to mankind can ever be derived from our knowing the constituent elements of the sun, or the proper motions of the fixed stars. Yet the progress of these investigations has been watched with the keenest eagerness by thousands who have neither the opportunity nor the capacity for joining in the investigations themselves. Nor can it affect our material welfare to know anything of the meteors which gave us the splendid spectacle of November, 1866. But the identification of the orbits of such meteoric streams with the paths of comets is a discovery of interest for thousands who cannot be called students of astronomy. More and more does it seem to be felt that there is something elevating and ennobling in the mere possession of the large conceptions which science supplies. The opening of the imagination, the lifting of the thoughts which inevitably comes from fuller knowledge, is felt to be a gain to humanity. And religious men put the same thing into still fitter language

when they urge that it is worth while to study God's works, of whatever kind, simply for the sake of knowing them, and that whatever else may be said about such knowledge, it is, as far as it goes, a good of the highest value.

It will seem but a repetition of the merest commonplace to say that science is gradually setting men free from many superstitions. But here, too, it is well worth while to note, that it is not the science itself which is producing this result, but the steady growth of the scientific spirit. The scientific spirit always creates an atmosphere in which superstition finds it hard to live. The facts on which the superstition rests remain what they were. And the arguments founded on those facts remain also. But the weight of such facts and arguments is entirely gone. Where the scientific spirit has not yet entered, nothing is more remarkable than the readiness with which the mind refers everything that cannot be accounted for to a supernatural cause. "How else can you account for it?" is felt to be a powerful argument. When once the scientific spirit has prevailed, this argument is no argument at all; and the reply is ready, "The fact that I cannot account for it does not tend in the slightest degree to prove that it is supernatural." So again where the scientific spirit has not yet entered, old traditions on every subject whatever have a high authority. Cures for illness, omens and warnings, proverbs, general facts of natural history, are stated and are accepted simply because they have been handed down. The scientific spirit challenges them all, and admits traditions only in their proper place as evidences of past beliefs, and possibly results of past observations. The consequence is, that superstitions of all kinds wither and die far beyond the limits to which science in any proper sense can extend, because the scientific spirit dries up their roots. For the scientific spirit teaches men to hold their judgment in suspense where there is no evidence on which to found a judgment. It is hard to the mind to draw no conclusion and have no opinion either one way or the other. But the scientific spirit stills the demand for an immediate judgment now by the prospect of a trustworthy judgment hereafter, and teaches that it is worth while to wait, and to wait long, if waiting will give a result that can be relied on.

The influence of the same scientific spirit can be traced in the increasing importance given to accuracy in statements of fact. Science very early learns the enormous difference in value between loose and accurate statements, and between statements of fact and theories or conjectures. And in all

life this importance is more and more felt. Histories of all times are being rewritten, in the endeavour to satisfy the demand for a more thorough sifting of the facts narrated. Statistics are valued high, and the collection of them undertaken by authority of State; and, in spite of the misuse that may be made of them, they are repeatedly taken as the only sure basis of action and legislation. Books on serious subjects rapidly lose estimation, even when they show great ability, if once their statements on matters of fact can be shown to be untrustworthy. This demand for accuracy is steadily increasing, because of the increasing sense of the value of such knowledge.

Yet again it is worth while to notice the steady penetration of the scientific spirit into legislation. All laws which concern finance are now examined and discussed on scientific principles. At all times, of course, men endeavoured when making laws to keep a purpose before them; and they very often in past times hit upon sound principles of finance by a happy accident. But the treatment of such questions as a whole with a distinctly scientific purpose belongs to the present day. Political economy, now so eagerly studied, was all but unknown a century ago. Now it gains a greater hold every day, and its authority is unquestioned. The resistance to its conclusions is invariably put into the form of an attempt to draw different conclusions from the same premises, or to introduce new premises; but not to deny the existence of the science, or its right to govern legislation. Side by side with more scientific legislation on finance, we can see an attempt made at more scientific treatment of crime and criminals. The bare determination to put down whatever could be pronounced a crime by a kind of brute force, is replaced by an endeavour to consider what means for repressing crime are at command; what are most likely to succeed, not only for a time, but permanently; what conditions should be observed in the use of such means. On all sides we hear discussions of punishment considered as a means of deterring the criminal by fear, as a means of maintaining the moral standard of the people, as a means of reformation. We may be far from a thoroughly satisfactory science of punishment; but the scientific spirit has plainly entered into all our dealings with crime, and shows itself in every attempt that we make to improve our system.

I cannot but look on it as a gain to humanity, that in all these various ways, and in others that I have not mentioned, the steady progress of the scientific spirit should be so marked

and unquestionable. It seems to me that there are many evils with which this spirit, and this alone, can grapple. Ignorance inflicts on mankind an amount of needless pain, which seems to exceed by far all that is due to any other cause. Ignorance is the source of a very large proportion of disease. Ignorance is the soil in which groundless suspicions of others, uncharitableness, cowardice, often cruelty and injustice, flourish most abundantly. Ignorance puts many temptations in the path of those who would be entirely safe if they had better knowledge. Ignorance is perpetually associated with degrading conceptions of God and of the spiritual world. Whatever dangers may attend the prevalence of science, yet assuredly men gain in dignity by their profounder acquaintance with the works of God, and with the laws which He has stamped on those works. No man who has gained even an imperfect insight into such knowledge would ever desire to return to his former ignorance. We may point out the evils that sometimes attend the progress of knowledge, but each man, when judging for himself, unhesitatingly accepts the evils if he can but obtain the knowledge.

But nevertheless, as I am reviewing the tokens of progress, it is but natural that I should indicate what appears to me to be the danger before us, and, if possible, the remedy.

The great danger that besets the scientific spirit is one which equally besets the development of every human tendency, and yet it is one by which men of science are peculiarly apt to fancy themselves unassailable. The danger that attends science is narrowness of mind.

There are two forms of this narrowness.

For, first, it is a temptation to every student of science to over-value science, perhaps even to question the value of everything else. There is such a power in the certainty which science gives, such a sense of solidity in the ground on which she plants our feet, that we are inclined in her presence, and following her guidance, to think that she must claim absolute supremacy. In education, for instance, we are tempted to think not only that all education should be scientific, but that it should sacrifice all other aims to science alone. To cultivate the imagination, to store the memory with great examples, to purify the taste, to kindle the higher affections, perhaps even to implant high principles of action and awake the conscience—all these are not to rank so high as the endeavour to indoctrinate the intellect with scientific discoveries and train it to scientific procedures. So, too, in the concerns of life, it is not unnatural to the student of science to think

that he has a special right to rule his fellows, and that it is only their blindness which prevents that right from being recognized. He does not see that until he has removed that blindness his knowledge, however perfect, will not justify his claim. This tendency in various forms—sometimes slight, sometimes serious—can often be recognized, and brings on science the reproach of arrogance, and makes the progress of science less welcome than it should be.

The second tendency of the same kind is even more frequently to be seen than the first. It is the tendency to fancy, as I have already indicated, that science, which is now in its infancy, has already conquered a vast proportion of the field that is open to it, and that that which we now call by the name covers a good deal of the ground. It was inevitable that science should begin its sure march with the simplest phenomena; for to begin with the complex baffled the human intellect so much as to make it impossible to recognize the true principles of advance. The Greek attempts, which began with the exceedingly complex phenomena of humanity, although the success which they achieved was marvellous, and some of their results will assuredly stand throughout all time, yet could never give men a conscious knowledge of the true scientific method, and much of their extraordinary intellect was wasted in consequence. The sciences of material nature are beyond all comparison more simple, and are gradually revealing to us what the scientific procedure really is. But in the meanwhile these sciences mislead us into the belief, that because they alone are yet cast in a scientific form, they alone are true sciences, and they alone ever will be. The student of science is thus tempted, not only to think that there is nothing but science in the world, but that there is no science except those which have already taken a scientific form. On the other hand, the instinct of the general public teaches them that there is a vast range of possible knowledge of far more value to men than a knowledge of material nature, and that is a knowledge of human nature. This cannot yet be treated as a science; but its importance is so exceedingly great that even in its present rough form it cannot be set aside or undervalued, and every attempt so to treat it only discredits the science whose votaries make the attempt.

This kind of narrowness is sometimes to be seen within the circle of the material sciences themselves. It is not at all uncommon for students of science to overvalue their own particular branch of it, and to undervalue others. It is not

at all uncommon for them to fancy that the scientific processes which they have employed, and rightly employed, in their own investigations are the only, or the most important, processes for all investigations. The observer, for instance, is tempted to think that he needs no special training to be an experimentalist; to fancy that the same precautions which are enough in the one case will be enough in the other. Was there not a signal example of this mistake given to us last year, when men of great name backed the impostures of Mr. Hoine? So, too, the mathematician sometimes shows himself singularly unable to handle the procedure required in chemistry or physics, and yet not to be aware of his own inability.

These are the dangers that attend the study of science; and in what is the remedy to be found? Assuredly in the progress of the scientific spirit. Science will cure its own evils. The scientific spirit is inconsistent with all narrowness of any kind. In its progress it will at last teach us to know the limits of science itself, the conditions and character of each kind of scientific process, the character and value of the other gifts with which God has enriched humanity, the existence and importance of branches of science which we have as yet hardly begun to study scientifically, because even the materials are wanting. In this way will science assuredly at last work out its own reconciliation with all else that man has reason to value. It will learn to know what is superior to it, as well as what is inferior; it will profoundly modify much that it now seems to ignore; it will gradually give a scientific form to what at present appears to be hardly capable of such a form at all. In the course of this progress men may possibly have to part with cherished ideas which now seem of vital importance, and this may cost much pain, perhaps more than pain. But assuredly it will, so far from touching the inner substance of the highest truth, end with giving to that truth immeasurably greater strength.

To the Christian it can never be otherwise than a fact of the deepest significance, that for centuries past Science and Christianity have been given by God's providence to the same nations. Look over the world, and you will see that as in civilization generally so pre-eminently in science the Christian nations take the lead. The missionary, wherever he goes, nowhere finds the people whom he visits able to cope in science with the people from whom he comes. There must be some deep connection between science and Christianity, between truth given by reason and truth given by revelation, between the knowledge of God's works and the

knowledge of His word, to produce this undeniable coincidence. The scientific spirit and the Christian spirit must have something in common. There must be some common purpose which they are to join in working out. They must be intended in some way to act and react on each other. They must in some way be gainers by each other's presence. And the Christian knows that the reason is, that both are the gifts of the same Giver.

It is then from a conviction, no less of its immediate services than of its ultimately far greater value to mankind, that I welcome the progress of the scientific spirit. That progress will of necessity be very slow; much slower than we should desire to make it if we had the government of the world. But the slowness of the progress appears to be the necessary condition of the stability of the conquest. Meanwhile every one who contributes to make men habitually observe more accurately, combine more skilfully, reason more strictly, confers a benefit on untold generations of his fellow-creatures.

Obituary Notices.

COMPILED BY THE REV. W. HARPLEY, HON. SECRETARY OF THE ASSOCIATION.

(Read at Exeter, July, 1872.)

I.

CHARLES BABBAGE, F.R.S., was born on the 26th December, 1792. Little is known of his parentage and early youth, except that he was educated privately. During the whole of his long life, even when he had won for himself fame and reputation, he was extremely reticent on that subject, and in reply to questions, he would uniformly express an opinion that the only biography of living personages was to be found, or, at all events, ought to be found, in the list of their published works.

At the usual age Mr. Babbage was entered at the University of Cambridge, where he graduated from Peterhouse in the year 1814. His name, however, does not appear in the Mathematical Tripos, he preferring to be Captain of the Poll to any honours but the Senior Wranglership, which he was not sure of obtaining. While he was at Cambridge he was distinguished by his efforts, in conjunction with the late Sir John Herschel and Dean Peacock, to introduce into that University, and thereby among the scientific men of the country in general, a knowledge of the refined analytic methods of mathematical reasoning which had so long prevailed over the Continent; whereas we in our insular position, for the most part, were content with what has been styled "the cramped domain of the ancient synthesis."

The youthful triumvirate made a successful inroad on the prejudices and predilections which had prevailed up to that time. Keeping this object steadily in view, in the first place they translated and edited the smaller treatise on the Calculus, by Lacroix, with notes of their own, and an appendix (mainly, if not wholly, from the pen of Sir J. Herschel) upon Finite Differences. They next published a solution of exercises on

all parts of the Infinitesimal Calculus, a volume which is still of great service to the mathematical student, in spite of more recent works with a similar aim. In this publication Mr. Babbage contributed an independent essay on a subject at that time quite new, the solution of Functional Equations.

By steps and stages, of which the records at our command are scanty, these pursuits gradually led Mr. Babbage on to that practical application of mathematical studies which may justly be considered to be his crowning scientific effort—we mean, of course, the invention and practical construction of the famous calculating engine or machine which the world has associated with his name. As a writer in the *Dictionary of Universal Biography* remarks :—

“The possibility of constructing a piece of mechanism capable of performing certain operations on numbers is by no means new; it was thought of by Pascal and geometers, and more recently it has been reduced to practice by M. Thomas, of Colmar, in France, and by the Messrs. Schültz, of Sweden; but never before or since has any scheme so gigantic as that of Mr. Babbage been anywhere imagined.”

His achievements here were twofold. He constructed what he called a Difference Engine; and he planned and demonstrated the practicability of an Analytical Engine also. The difficulty of making the nature of such abstruse inventions at all clear cannot be doubted, since Dr. Lardner, no unskilful hand at mechanical description, filled no less than twenty-five pages of the *Edinburgh Review* with but a partial account of its action, confessing that there were many features which it was hopeless to describe effectually without the aid of a mass of diagrams. All that can here be said of the machine is, that the process of addition automatically performed is at the root of it. In nearly all tables of numbers there will be a law of order in the differences between each number and the next. For instance, in a column of square numbers—say 9, 16, 25, 36, 49, 64, 81, &c.—the successive differences will be 7, 9, 11, 13, 15, 17, &c. These are differences of the first order. If, then, the process of differencing be repeated with these, we arrive at a remarkable simple series of numbers, 2, 2, 2, 2, &c. And into some such simple series most tables resolve themselves when they are analyzed into orders of differences; an element—an atom, so to speak—is arrived at, from which, by constant addition, the numbers in the table may be formed. It was the function of Mr. Babbage's machine to perform this addition of differences by combinations of wheels acting upon each other, in an

order determined by a preliminary adjustment. This working of differences gave it the name of the Difference Engine. It has been repeatedly stated that the construction of this machine was suddenly suspended, and that no reason was ever assigned for its suspension; but the writer in the *Dictionary* already quoted above states that—"In spite of the favourable report of a Commission appointed to inquire into the matter, the Government were led by two circumstances to hesitate about proceeding further. Firstly, Mr. Clements, the engineer or machinist employed as his *collaborateur*, suddenly withdrew all his skilled workmen from the work, and, what was worse, removed all the valuable tools which had been employed upon it"—an act which is justified as strictly legal by Mr. Weld, in his *History of the Royal Society*, though a plain common-sense man of the world may reasonably doubt its equity, as the tools themselves had been made at the joint expense of Mr. Babbage and the Treasury. "Secondly," says the same authority, "the idea of the Analytical Engine—one that absorbed and contained as a small part of itself the Difference Engine—arose before Mr. Babbage." Of course, he could not help the fact that "Alps upon Alps should arise" in such matters, and that when one great victory was achieved, another and still greater battle remained to be fought. But no sooner did Mr. Babbage, like an honest man, communicate the fact to the Government than the then ministers, with Sir Robert Peel and Mr. H. Goulburn at the head of the Treasury, took alarm, and, scared at the prospects of untold expenses before them, resolved to abandon the enterprise.

Mr. Babbage, apart from all help from the public purse, had spent upon his machine, as a pet hobby, no small part of his private fortune—a sum which has been variously estimated between £6,000 and £17,000. And so, having resolved on not going further into the matter, they offered Mr. Babbage, by way of compensation, that the Difference Engine as constructed should remain as his own property—an offer which the inventor very naturally declined to accept. The engine, together with the drawings of the machinery constructed and not constructed, and of many other contrivances connected with it, extending, it is said, to some 400 or 500 drawings and plans, were presented in 1843 to King's College, London, where we believe they are to be seen in the Museum, bearing their silent witness to great hopes dashed down to the ground, or, at all events, to the indefinite postponement of their realization.

In speaking at this length of Mr. Babbage's celebrated

machine, we have a little anticipated the order of events, and must return to our record of the leading facts of his life. In the year 1828 he was nominated to the Lucasian Professorship of Mathematics in his old University, occupying in that capacity a chair which had once been held by no less a man than Sir Isaac Newton. This chair he held during eleven years. It was while holding this Professorship, namely, at the general election of November, 1832, which followed on the passing of the first Reform Bill, that he was put forward as a candidate for the representation of the newly-formed borough of Finsbury, standing in the advanced Liberal interest, as a supporter not only of Parliamentary, financial, and fiscal reform, but also of the "Ballot, triennial Parliaments, and the abolition of all sinecure posts and offices." But the electors did not care to choose a philosopher, so he was unsuccessful, and, we believe, never again wooed the suffrages of either that or any other constituency.

The limits of this notice prevent us giving a full list of the works of which Mr. Babbage was the author, which extended to upwards of eighty volumes. Their names can be seen recorded at full length in the new library catalogue of the British Museum. Further information respecting them will be found in the twelfth chapter of Mr. Weld's *History of the Royal Society*, which we have already quoted. Two or three of them, however, we should specify. The best known of them all, perhaps, is his *Ninth Bridgewater Treatise*, a work designed by him at once to refute the opinion supposed to be implied and encouraged in the first volume of that learned series, that an ardent devotion to mathematical studies is unfavourable to a real religious faith, and also to give specimens of the defensive aid which the evidences of Christianity may receive from the science of numbers, if studied in a proper spirit.

Another of his works, which has found a celebrity of its own, is a volume called the *Decline of Science*, both the title and the contents of which give us reason to believe that its author looked somewhat despondingly on the scientific attainments of the present age. The same opinion was still further worked out by Mr. Babbage in a book on the first Great Exhibition, which he published twenty years ago. Another of his works deserving of mention here is one on the *Economy of Manufactures*, which was one result of a tour of inspection that he made through England and upon the Continent in search of mechanical principles for the formation of Logarithmic tables.

It is about forty years since Mr. Babbage produced his Tables of Logarithms from 1 to 108,000, a work upon which he bestowed a vast amount of labour, and in the publication of which he paid great attention to the convenience of calculators, whose eyes, he knew well, must dwell for many hours at a time upon their pages. He was rewarded by the full appreciation of his work by the computors not only of his own, but of foreign countries; for in several of those countries editions from the stereotyped plates of the tables were published, with translations of the preface. Notwithstanding the numerous logarithmic tables which have since appeared, those of Mr. Babbage are still held in high esteem by all upon whom the laborious calculations of astronomy and mathematical science devolve.

Mr. Babbage was one of the oldest members of the Royal Society at the time of his death; he was also, more than fifty years ago, one of the founders of the Astronomical Society, and he and Sir J. Herschel were the last survivors of that body. He was also an active and zealous member of many of the leading learned societies of London and Edinburgh, and in former years at least an extensive contributor to their published *Transactions*. As a single illustration of these contributions, may be mentioned a paper read by him before the Royal Society in 1862, to explain the way in which human remains might become mixed with the bones of extinct mammalia in cave-deposits; for, as he justly observes, "whilst we ought to be quite prepared to examine any evidence which tends to prove the great antiquity of our race, yet, if the facts adduced can be explained and accounted for by the operation of a few simple causes, it is unphilosophical to infer the co-existence of man with those races of extinct animals."

As a testimony to his great merits and unwearied exertions in the field of science, he was proposed and unanimously elected the first Honorary Member of this Association in 1867. He died at his residence in Dorset Street, Marylebone, in October, 1871, at an age little short of eighty years.

II.

S. S. BASTARD, long resident in Exeter, and a Justice of the Peace for that city, was one of the earliest members of the Association, having joined it on the occasion of its first annual meeting in 1862, and always manifested a warm interest in its welfare. He died in the spring of the present year.

III.

WILLIAM BOOTH was elected a Member of the Association at its fourth meeting at Tiverton in 1865. He died at Torquay, December 24th, 1871.

IV.

RICHARD TONSON EVANSON, M.D., was a native of the county of Clare, in Ireland, and received his education in Trinity College, Dublin, of which he was a distinguished alumnus. He commenced his medical studies as an apprentice to the late Sir Philip Crampton, then Surgeon-General to the Army in Ireland ; and in due time became a Fellow of the Royal College of Surgeons. He soon, however, turned his attention to medical practice ; and having graduated as Doctor in Medicine in the University of Glasgow, he settled in Dublin as a physician, and undertook the office of Lecturer in *Materia Medica* in the Park Street Medical School. There he was associated with the late Sir Henry Marsh, Dr. Arthur Jacob, Dr. Beatty, Dr. William Stokes, and other teachers whose names brought an European reputation to the Medical School of Dublin during the second quarter of the present century. From Park Street School, Dr. Evanson was subsequently transferred to the Chair of Medicine in the Royal College of Surgeons, and he was rapidly rising into eminence as a practitioner, when ill-health obliged him to remove to warmer climates. For many years he was a wanderer upon the Continent of Europe ; but during all that time he never abandoned the practice of his profession, and many English persons of distinction enjoyed the benefits of his skill, and were his patients in the cities where he sojourned. The last of these was the late Duke of Northumberland, whose medical adviser and confidential friend he was for some years. After the Duke's death he retired from private practice ; but his love for his profession never diminished, and he continued in close and friendly intimacy with a large circle of its members, by whom his kindness of heart, comprehensive charity, and never-failing benevolence, were warmly estimated. Dr. Evanson's literary abilities were very considerable. He was a frequent contributor to the current medical literature of his time. In 1836 he published, in conjunction with his early and never-forgotten friend Dr. Maunsell, a *Practical Treatise upon the Management and Diseases of Children*, which was at once recognized as a standard work, was reprinted in America, translated into German, and rapidly passed through five

editions. He did not, however, confine his labours within professional limits. As he said, he had early formed a habit of rhyming, and never abandoned it up to the close of his life. So lately as 1868 he published a poem under the title of *Nature and Art*, with a number of "occasional verses and elegiac stanzas," the latter of which teem with the tenderness and affection which characterized his gentle nature. The motto which he selected for the title-page of this book was indeed the key of his whole life :

"He prayeth best, who loveth best
All things, both great and small;
For the dear God who loveth us,
He made and loveth all."

Besides his published works, he wrote and delivered several lectures and addresses to the Torquay Natural History Society, of which he was for many years a member, and took an active part in promoting its usefulness and prosperity. The last public act of Dr. Evanson's life was when he presided at the entertainment given by the medical men of Torquay to the members of the British Medical Association who attended the annual meeting at Plymouth in August last. On that occasion he was unanimously chosen by his brethren at Torquay as the most fitting person to take the chair; and although evidently suffering and weakened by the disease that was preying upon him, it seemed as if his former vigour and eloquence, for which he was always remarkable, had returned for the occasion, and he spoke with the energy of youth, and the elegant diction of a Christian philosopher and poet; and never did his bright, genial, social, warm-hearted character show more clearly than it did then, placed as he was at the head of a brilliant assembly of the *élite* of his profession. His connection with the Devonshire Association extended over a period of eight years, he having become a member at the annual meeting at Torquay in 1864, and attended that and several subsequent meetings. He died on October 26th, at his residence, Torquay, in his seventy-second year. On the night previous to his death he was restless, and had determined to remain in bed somewhat longer than usual; but about midday he was found to have passed away tranquilly, without a struggle, and as if in sleep.

V.

The REV. EBENEZER PROUT, F.G.S., was born at Plymouth, June 17th, 1802. He was the youngest of fourteen children, one of his elder brothers being the late Samuel Prout, the

eminent water-colour painter. He received the kind of schooling that was accessible to the sons of tradespeople in those days; but an important part of his education was pursued out of school hours. His love of nature, and his habits of accurate observation, soon made him familiar with the form, flight, and song of nearly every bird in the neighbourhood, and with a multitude of other objects in the animated world around him. After a few years of business in Plymouth, Bristol, and London, he devoted himself to the Christian Ministry among the Independents, and entered Highbury Theological College in 1826 for a course of four years training. His first settled pastorate was at Oundle, Northamptonshire (1832–1836). There he made the acquaintance of the late Rev. John Williams, the distinguished Missionary to Polynesia, who was murdered at Eromanga. His early zeal for missionary service revived, and he resigned his pastorate in order to accompany Mr. Williams on his return to the South Seas as an agent of the London Missionary Society. For some months he pursued a course of medical studies at Guy's Hospital, under Sir Astley Cooper and other highly esteemed professors. But the unfavourable opinion of a physician as to his health compelled him to abandon his hopes of foreign service; and in 1837 he settled as minister at Halstead, Essex, where he spent eight happy and useful years. During this time he published the *Memoirs of the Life of the Rev. John Williams*, a book possessing no little literary merit, which was received with considerable favour, and obtained a large circulation. This was his best known work, though he subsequently published several smaller books, principally on missionary subjects. In 1845 he accepted the office of travelling secretary for the London Missionary Society, and removed to Torquay for the benefit of Mrs. Prout's health. It was now that he prosecuted his geological studies, occupying the leisure hours of his numerous visits among the formations of our south western counties, in exploring the strata so rich in fossil remains, and in making a large and well-classified collection. In 1848 he removed to London, and became Home Secretary of the Missionary Society, an office which he held for more than sixteen years. In 1849 he was admitted as a Fellow of the Geological Society. His changed circumstances prevented him continuing his geological researches, but his love of natural science led him to make the microscope and its marvellous revelations both a study and a recreation for his evening hours. Only about a year before his death he purchased a fine Browning's Reflector, and had

begun a systematic study of astronomy. In 1867 failing health induced him to leave Reigate and return to his former home, Torquay, where he spent the remainder of his life, and devoted his leisure to various works of Christian benevolence. In the same year as he returned to Torquay he was elected a member of this Association. He died October 2nd, 1871, aged 69 years, and was buried in his family grave at Reigate.

Mr. Prout was endowed with a very active and powerful mind. Though a Nonconformist, and not shrinking from controversy when he deemed it necessary, he had a large and liberal heart, and delighted in the friendship of Christians of every name. His generosity and practical piety were well known to his more intimate acquaintance, while the geniality of his nature made him always welcome to a very large circle of friends.

VI.

WILLIAM HENRY TINNEY, Q.C., a once celebrated lawyer, the contemporary of Brougham and Campbell, was educated at Oriel College, Oxford, where he took high honours, and was in due course elected a Fellow of his College. He was called to the Bar in 1811, and was made a Queen's Counsel and Bencher of Lincoln's-Inn in 1829. He was eminent as a real property lawyer, and was one of the Real Property Commissioners with Lord Campbell. It is a strong testimony to the high estimation in which his legal knowledge and personal character were held, that he was, though himself a staunch conservative, appointed to a vacant Mastership of Chancery by a whig government. On the abolition of the Masters' offices he retired with a pension of £2500 a year. The last years of his life he spent at Torquay, and was a Member of the Natural History Society there. He joined the Association at the Tiverton Meeting in 1865. He died at his residence, Snowdenham, Torquay, on November 30th, 1871, at the ripe age of 88 years, lamented, not only by a large circle of attached personal friends, but by the many who had profited by his open-handed liberality in matters of charity.

VII.

The REV. J. B. SELWOOD, M.A., Vicar of Shute, near Axminster, became a Member of the Association in August last at Bideford. His connection with it was of very brief duration. He died in the following October. He was well known as a pains-taking naturalist.

FOSSIL TEETH AT SIDMOUTH.

BY P. O. HUTCHINSON.

(Read at Exeter, July, 1872.)

IN 1869 there was laid before the Association an account of a fossil tooth procured from the bottom of the sea at Sidmouth. [Trans. III. 143.] At the meeting of 1871 a notice was given of the finding of a second tooth at Sidmouth. [Trans. IV. 455.] Strange enough, in February this year, 1872, a fisherman picked up a portion of a third, nearly opposite the place where the first was found. This third is very much rounded by attrition, having for some time been rolled on the beach by the waves. There was reason to suspect that all these teeth emanated from the outside extremity of a reef of rocks, commonly known as the tortoise-shell reef by the sailors, and lying off the shore at about a mile west of Sidmouth. The one that was first dredged up came from that spot, and the third from the beach near it. On more minute examination of the place by means of a boat, and by wading at low water spring tides, some large bones were observed by a fisherman jammed in among the rocks or embedded in the sand, and were by him in some degree detached. One of these, being a curved piece nearly three feet long, was brought to me and offered for sale as the tusk of an elephant. I rejected it because it was not of ivory, nor the tusk of any animal, and at that time I doubted the accuracy of the story. It is certain, however, that it was part of a very large bone. It was afterwards sold to R. N. Thornton, Esq., of Sidmouth.

From these circumstances it might almost be conjectured that the skeleton of some large mammal lies stranded, or rather buried, at the locality indicated, and that some portions of it have become loosened and uncovered. It is just possible that something more may yet be recovered from this apparently prolific field; but as an examination can only be made at certain seasons of the year, namely, the equinox, when the tide falls lower than at other times, and under the concurrence of such favourable circumstances as fair wind

and fair weather, great delays in following up the search have been unavoidable.

So much for what has been discovered at sea; I have now something to say of what has since been discovered on land. I exhibit a completely fossilised tooth of larger size than the former, which was found by a fisherman in the bed of the river Sid, at about half-a-mile from the sea. It has no connection with the preceding teeth already mentioned. Perhaps it may be observed that at the bottom of the valley of the Sid there lies a bed of alluvium of recent or quaternary formation, varying in thickness from ten to twenty feet. This alluvium is composed of subangular stones of flint or churt, of gravel, sand, and in some places, of fine mould, most of which appears to have been deposited in still water. As this tooth was not found *in situ*, I have no theory to offer, but merely content myself with recording the simple circumstances of the case.

On the 16th of April this year, 1872, a young man named William Ware was wading up the bed of the river in search of lampreys, or lamprey ells as they are often called. The lamprey, like the salmon, enters rivers at certain seasons from the sea, and these fish are much sought after as good bait for whiting pollock. Thus employed he came upon this tooth, which he took up, but was not aware of its nature. Another man who was near told him he had observed it occasionally for two months past lying in the shallow water, but paid no regard to it. William Ware took it home to his father, who sold it to me. I have no reason to doubt this story. The find is an important one locally speaking, because, as far as I know, it is the first that has occurred in this neighbourhood; and it may be observed, that where one has been found, other fossil remains may reveal themselves at some future day. The weight of this specimen is 12 lbs. 5 ozs.

WHAT IS GRIMSPOUND ?

BY G. WAREING ORMEROD, M.A., F.G.S.

(Read at Exeter, July, 1872.)

VARIOUS opinions exist as to the purpose for which Grims-pound was built. Polwhele, in his *History of Devon*, published in 1797 (vol. i. page 140), writes thus: "That Grims-pound was the seat of judicature for the Cantred of Durius is no improbable supposition." Page 151: "Within that curious amphitheatre in the parish of Manaton, called Grims-pound, are no less than 20 circles, not one of which exceeds a land yard (five yards and a half) in diameter. They all seem to have been formed by stones erect; but in each case where the pillars are fallen, or have disappeared, the circumference is distinctly marked by heaps of small stones. Some of the pillars which lie on the ground plainly point out their original station, and might easily be replaced. At present there are only two perfect circles, one of which consists of 35 pillars, the other of 27; in both cases the pillars are placed at equal distances, and there are six circles (each about twelve feet in diameter) in contact with each other. The wall that encloses these 20 circles is 96 land yards (528 yards) round. It was build with rough moor-stone without cement. In several places where it is entire it is about six feet in height, and of the same thickness; but it is in general in ruins, and a mere heap of stones. From the east part of this circular mound to the west are 22 land yards (121 yards), and from the north to the south 28 (154 yards). There is an entrance on the east side of this amphitheatre, and another on the west side of it, and at each entrance there is an appearance of a flat pavement. The north side of this wall, which is washed by the Grimslake, is the boundary between North Bovey and Manaton. As to the uses of the circle, there is no doubt but these monuments in general are of religious institution, and designed originally for the site of worship. The circles within the stone enclosure of Grims-pound are the most remarkable

in Devonshire. It is probable that this spot was one of the principal temples of the Druids."

Rowe, in his *Perambulation of Dartmoor* (edit. 1856, page 55), under the head, "Pounds or Circunvallations," writes thus : "Grimspound is by far the finest and most extraordinary of all the relics of their class. The wall, or mound, is formed of moorstone blocks rudely piled up, but not so large as not to be easily displaced. The base of this rampart covers in some places a surface of 20 feet in breadth; but the average height of a section, taken at any point, would not exceed six feet. With the exception of an opening on the east and west sides the enclosure is perfect, surrounding an area of about four acres. The original entrance is supposed to have been on the south. The vestiges of ancient habitations within this primitive entrenchment are numerous. A spring rising on the easterly side, and skilfully conducted for some distance below the wall, supplied the inhabitants with pure water; and the whole presents a more complete specimen of an ancient British settlement, provided with means of protracted defence, than will perhaps be found in any other part of the island." Writing of Grimspound in another part of the same work, he adds (page 156) : "A large stone on the eastern side of the circle marks the spot where the spring rises, and from whence beneath the foundations of the wall it flows, under the name of Grimslake, to join the Webburn. After a dry spring, and a whole month of continuous hot weather immediately preceding, I have found at Midsummer a clear and copious stream issuing immediately from the source." After noticing that Grimspound was totally unprovided with any kind of ditch or additional outwork, Mr. Rowe adds (page 157) : "The rampart is doubtless much lower than it was originally built; but unlike many of the *valla* of our hill-forts and earthworks, it has not been tampered with, or the original design altered by successive occupants."

Sir Gardner Wilkinson, in a paper "On the British Remains on Dartmoor," in the 18th vol. of the *Journal of the British Archaeological Association*, 1862, notices Grimspound. He writes : "Its position is well chosen to command the passage over the hills, and to intercept the communications through this part of the country. The site has not been chosen without due consideration of its merits in a military point of view; for though we should now consider it to be commanded by the hills on either side, this was no objection in olden times for the position of a fortified town."

In 1829 the late Rev. Mr. Mason, of Widdicombe-in-the-

Moor, had a plan of Grimsound taken by Mr. A. C. Shillibeer. The contents of the pound, exclusive of the boundary wall, are four acres statute measure; the boundary wall, one rood thirty-six perches; in all, four acres, one rood, thirty-six perches.

In a paper "On the Hut Circles of the Eastern side of Dartmoor" by myself, read before The Teign Naturalists' Field Club in August, 1861, and afterwards printed in a more extended form in the *Journal of the British Archaeological Association* for 1864, I endeavoured to show that the circular huts on Dartmoor formed groups or villages, and in each of these one hut was of a character much superior to the remainder. The remains at Bovey Combe Head, near Grimsound, are eminently of this character. They are situate on a spur of the hill on the easterly side of the summit of Shapley Common, so far below the brow of the hill as to be in some degree screened from the winds and storms of Dartmoor; but at the same time in one of the most commanding situations of the district. This place, I think, was probably the dwelling of the person who presided over Grimsound, and the numerous hut dwellings in the vicinity of Vitifer; —probably those of the men who streamed the tin in the Webber, and made the open cuttings—"The Old Men's Works"—between Headland and Vitifer.

It will have been noticed that the description of the wall of Grimsound as given by Rowe differs from that of Polwhele. The latter states that the wall was built of rough stone, and that in *several places where it is entire it is about six feet in height, and of the same thickness*. Rowe speaks of the enclosure as a wall, or mound, of blocks rudely piled up; that it is doubtless much lower than it was originally built; and that it has not been tampered with, or the original design altered by successive occupants. It is evident that Rowe considered, erroneously, the enclosure to have been originally a mound; Polwhele, however, is correct, for in a few places slight portions may still be seen. These are not, however, now six feet high. At the most perfect place on the south side several courses can be seen, both on outside and inside, and the diameter of the wall is there nearly ten feet. To me it would seem that the outer and inner parts of the wall were built in courses of rough masonry, the interior part being filled with irregular stones, mixed probably with earth. The supposed south-eastern entrance can still be seen.

For what purpose was this enclosure made? Polwhele considers that it was a Druidical Temple; Rowe and Sir

Gardener Wilkinson, that it was a fortified town ; the late Dr. Croker, in his *Guide to the Eastern Escarpment of Dartmoor* (page 15), writes : " It could hardly have been an encampment, on account of its situation in a valley."

Firstly, as to Polwhele's opinion. Had he examined many of the huts on Dartmoor, he would have seen that they are generally formed internally of an upright circle of granite slabs, and that against this stones and earth are placed, sometimes in courses, but oftener rudely piled together, and that occasionally, but rarely, a third or outer circle has been built. The outer wall in the generality of circles often falls away, and the inner row of slabs remains ; these are the stones which Polwhele considered to be a series of pillars. Without entering into the vexed point whether certain series of remains are ascribed correctly to the Druids or not, it will be sufficient to remark that those remains, as at Merrivale and Teigncombe, are accompanied by stone avenues, stone pillars, kistvaen, and cromlech ; these are at Grimsound completely absent. There does not appear to be a particle of evidence that Grimsound was ever a place for worship, and I am not aware of any subsequent author agreeing with Polwhele's opinion.

Secondly, was it a fortified town ? Grimsound is 154 yards from north to south, and 121 from east to west, and contains within the wall four acres ; it is placed in a narrow side valley on the northerly slope of Hamildon Down, which rises rapidly from the pound. It is overlooked on every side ; from the north and east it would be at the mercy of the archer, and from the south the archer would also have command over it, and a few strong men, armed with the missile found on the spot, stones of granite, certainly with a sling, and in a great measure by the hand, would soon compel this so-called fortress to surrender. With respect to the stream mentioned by Rowe, as being conducted through the pound, this is not mentioned by Polwhele. The course exists, but I have never, though often visiting Grimsound in the course of the last fifteen years, seen any water in it ; it was a diversion of part of the Grimslake, to which it seems now to have returned.

Thirdly, was it a village, or association of huts ? With the south-western part of Dartmoor I am not well acquainted ; but I believe that I have thoroughly examined most parts of the remainder of the moor ; and the huts, circles, and other remains from Cawson to Rippon Tor I have carefully mapped. In the districts with which I am acquainted the villages consist of

detached huts, which for the most part have had fields adjoining them, and the traces of the enclosure walls can now be seen. In connection with these villages sometimes circular enclosures occur, varying in size and character, of which that of Grimsound is the largest that exists on Dartmoor. The next in size is Dennabridge Pound, near Dartmeet. This is nearly circular ; it measures from north to south 110 paces, and from east to west 117 paces ; the height of the wall is about five feet and a half ; the thickness at the base three feet, and at the top two feet and a half, and has a double facing. Mr. Bray, in *The Tamar and the Tavy* (vol. i. page 135), says : "Though far beyond the memory of man, this superstructure is unquestionably modern when compared with the base or foundation, which is ruder, and of larger stones." Mr. Bray thought that he could distinguish the vestige of a small circle near the centre. Mr. Spence Bate, in a "Report on the Archaeology of Dartmoor," in the *Transactions of the Devon Association* for 1871 (page 497), mentions enclosures at Shell Top, near the head of the Yealm, which, he says, are of very similar character to Grimsound. These he considers to be villages. The remains at Shell Top I have not seen. Those at Yealm Head consist of two adjoining enclosures, containing a few huts, and several hut circles are situated externally, and at some of these the traces of enclosure walls can be seen. Of the two enclosures the lowest is nearly circular, and is about 96 paces from north to south, and has five huts near the west, north, and easterly sides, of which the foundations are clear ; the rest of the area is apparently open. The adjoining enclosure is of an irregular, semi-circular shape, being probably an addition to, and is larger than the last-mentioned, and contains the foundations of five huts, and scattered stones, which probably are the ruins of a few more. These are mostly near the enclosure wall ; one near the centre is of a higher style of hut, having an outer wall. As at Grimsound, there are no dividing walls inside either of these enclosures. The walls of the hut circles are similar to those generally met with, but the inner row of upright slabs does not always occur, but one example is shown in Mr. Bate's sketch. The enclosure walls were probably not more than three feet wide at the base, and not larger than the moor walls in that district. On Shiffle Down, to the west of the Teigncombe village, there are old pounds, small in size ; and at Vitifer and Headland they also occur ; but these last are of comparatively recent state. Some of what are popularly known as sacred circles, as, for example,

those at Scor Hill, the Grey Wethers, and perhaps Fernworthy Circle, may possibly have been used for the purpose for which I think Grimsound was built. Similar erections, with the space intervening between the upright stones, filled up with turf and furze in other parts of the world, as in Canada, and near the Cape, are, I am informed, used for that purpose ; but those I have named are claimed as " sacred," and I will not notice them further. What, then, is the purpose for which Grimsound was built ? I do not for a moment suppose that it was built either as a place for worship, or as a place of defence ; had it been intended as a place of residence, there is no reason why a strong perpendicular wall should be required round twenty huts of small size in a sheltered spot, when so many huts of a superior character in more exposed stations had no protection at all. But in the days when Grimsound was built there were doubtless wolves on Dartmoor, and, if legends are true, there were bands of robbers, to whom cattle would be also a great temptation. For the protection of cattle from these, and in the severe winters of Dartmoor, I think that Grimsound, Dennabridge, now used as the pound for the cattle straying on the forest and other smaller pounds, were erected, and that the huts were for the dwellings of the owners or herdsmen.

IRON PITS.

BY P. O. HUTCHINSON.

(Read at Exeter, July, 1872.)

THE pits commonly called Iron Pits, which are found scattered over many parts of eastern Devonshire, and are met with in several of the other English counties, though by no means recently discovered, have never received the attention they deserve. Despite a considerable amount of mystery and uncertainty that has hung over these places, they appear to be nevertheless rightly named; for notwithstanding that some persons have questioned the motives for which they were originally dug, there seems no doubt now that they were sunk for the purpose of seeking iron ore. By whom, or by what people, they were made, is a question not so easy to answer. In Devonshire they occur mostly, if not entirely, on the hills capped by the Green-sand formation, covered in places by a bed of plastic clay mixed with angular flints. As existing on the Egton and the Goatland Moors, near Whitby, in Yorkshire, they are known as "Killing Pits," and by some are supposed to be the remains of a British village. This impression, if it shows nothing else, proves at all events a belief in their great antiquity. There are 150 or more still to be traced at the former place, and many of them from three to four feet deep.

Within the busy confines of Leeds, it is recorded that in making excavations in Briggate, one of the principal streets, there were found many "Bell Pits," as they were termed, from which the iron stone had been taken. We are further informed that the cemetery at Burmantofts, near the same town of Leeds, has been found to be pitted all over with these holes. In seeking for ore, the excavator seems to have dug a pit about six feet in diameter, though this size of course much varied; and when he came down to the iron stone, he worked away all round as far as he could go without letting the sides fall in. Instead of advancing straight forward, and digging back or throwing back, as the phrase is, or instead of proceeding to make a gallery excavation, as the miners call it,

he got out of his pit and then sunk another. [*Smile's Industrial Biography*.] This is manifestly a rude and an unscientific mode of mining; but the process on our own hills in Devonshire appears to have been precisely the same as that followed in Yorkshire.

Coming a step nearer, we read in *Camden* of "Pen pits in a piece of gravelly, clayey waste near the church [of Pen, not far from Mere, in the county of Somerset], forming inverted cones from ten to fifty feet in diameter, and from five to ten at the bottom, upwards of 20,000 in no regular arrangement. The pits are extremely curious," he adds.* Perhaps these last, occurring near Mere, if not for iron, may have been made when searching for lapis calaminaris, or oxide of zinc, used in the manufacture of brass, as such a mineral has been found not far from that neighbourhood, at all events in recent times.

There are several places in Derbyshire where heaps of refuse, as from the miners' operations, have been met with, and called "Old Men's Workings." At Rivaulx, in Yorkshire, and at Hackness, similar remains have been met with; but these latter are not so ancient, apparently, as the diggings elsewhere alluded to, but are rather the traces of works probably carried on by the monks of the neighbouring abbey during the middle ages.

Coming into our own district, it is observed by Lysons, that on the Blackdown Hills there are pits called "iron pits, and by some supposed a British village." However much these pits may resemble the pit dwellings of the ancient Britons, common consent, nevertheless, ascribes them to the operations of the miner. Near Kentisbear, and between Pool, Punchardon, Saint Hill, and Henland, there are numerous hollows, sometimes called "Ash Pits." A farm labourer told me, many years ago, that he once had occasion to cross one part of Punchy Down late in the evening, and that he got entangled in pits and hollows, into which he was continually falling, until he became so bewildered as scarcely to know where he was, or how to extricate himself. On another occasion, when conversing with Samuel White, at Belbury Castle, May 31st, 1861, he said that when he was a boy (nearly seventy years before), he was walking across the hill, carrying a bundle of "spargads" or sticks used by thatchers to secure the thatch, and he became entangled in the same manner in a labyrinth of pits.

* "Gough's Camden," Edition of 1806, I. 99; and "Collinson's History," III. 43.

Mr. James Blackmore, of Clivehays, Church Stanton, writing to Mr. Heineken, August 5th, 1865, on these subjects, observes that all the extent of Blackdown in his neighbourhood was once worked for surface iron, as it was called. "My father," he adds, "a few years since dug out several tons of the ore from a space about ten feet square, and it is now beside the garden wall." At another time he speaks of the pits as being "in thousands." Many of these have been filled in where the land has been reduced to cultivation; but they are brought to light on excavating. There is a grand group of them about half a mile north of Wolford Lodge, and on the Combe Rawleigh side of Dunkeswell Common. Though there are a few hedges running across the top of the hill, and thereby forming large enclosures, the heath, furze, and fern, still grow there as wild as ever. They are at about 150 feet west of the road, and they chiefly occupy an area of some 700 feet across, taken in either direction. They are of different sizes and shapes, more or less round, or oval, or irregular, the sides chiefly sloping from having fallen in. They vary from eight to ten feet deep, and from twenty to thirty in diameter. On actual measurement, one proved to be nineteen feet by twenty-three. Being there with a friend one day, and not wishing to court observation from the road, the horse and carriage were led down to the bottom of one of them, and nothing was visible outside. This will prove the size of some of them at least. At Moorlands, a mile east of Dunkeswell Common, there is another group. Having, some years ago, had a correspondence on these subjects with the late Rev. H. A. Simcoe, I received a letter from him, dated October 22nd, 1862, in which he expresses an intention of having some of the pits on his own land opened; but as he was then in Cornwall, he hoped I would not wait, but that I would prosecute a search amongst them myself. This I did on more occasions than one; but although there was no difficulty in turning up pieces of haematite and ironstone, I was not so fortunate as to discover the remains of a forge. Mr. Simcoe subsequently carried out his intention, but the result was the same.

But there are numerous pieces of scoria to be found in the fields near Northcott, in the parish of Uffculme, some of which I have, indicating that there had been a smelting-place not far off. In a field at Tudborough, near Hemyock, the plough continually turns up cinders, and doubtless there had been a bloomery or melting-pit near them. It seems reasonable to suppose that, though the ore was procured on the hills, the reducing process was carried on in the valleys, perhaps in

localities where wood (used in the form of charcoal) was more easily obtained. At Bowerhayes Farm, near Dunkeswell, there were "heaps of cinders," as the informant said. A blacksmith living by the roadside near this place, in answer to questions put to him, said that he had taken some of these cinders and tried them in his forge, but could make nothing of them: and, suiting the action to the word, he took up a clinker, saying, They were very like that, only as big as his head. At Church Stanton, in the Blackdown Hills, there are the remains of several smelting-places, indicated by scoria and slag, and one of them is near the Rectory. If these furnaces consisted in nothing more than a pit in the earth, like the old bloomery, perhaps an examination of them might yield favourable results. It is possible they might yield such objects as pieces of metal, or traces of tools.

There is a group of iron pits on Ottery East Hill, just above Lincombe Farm, in the parish of Sidbury, and at about four miles from Sidmouth, which I have several times had an opportunity of examining. They are about a hundred in number. From the fact that the ore is here found near the surface, these pits are small and shallow compared with those at Wolford Lodge. The farmer who first showed them to me supposed they were something of the nature of rifle-pits, "and used in the wars," as he expressed it. It needs but a glance, however, to perceive what they really are. They yield pieces of ironstone, and this is all they have furnished so far. The bloomery, or place where the reduction of the ore was effected, has hitherto escaped detection. There are some elevations near Kirkstall and Calverly, in Yorkshire, called Cinder Hills, and there is a valley near Church Stanton known as Sindercombe, or Cindercombe; but I do not know how they got their names, or whether any scoria or cinders have ever been found there. It may be further remarked that the various workings above alluded to, and lying as they do in different parts of the country, are uniformly ascribed to a very remote antiquity: nevertheless, there are reasons for supposing that the operations of digging and smelting were continued down to mediæval times, and possibly in some of these very places. In the neighbourhood of Dunkeswell it is not unlikely that the Monks of the Abbey worked the pits in their day. Had the product of this ore been cast iron, it is hard to imagine how the ancient tribes could have converted it into wrought iron; but, fortunately for them, the haematite and bog iron occurring on these hills, when smelted with charcoal, yield ductile or maleable iron at once.

ON ASTIGMATISM AND COLOUR-BLINDNESS.

BY E. VIVIAN, M.A.

(Read at Exeter, July, 1872.)

ON the 8th of March last, I heard the Friday evening's discourse at the Royal Institution, Albemarle Street, by Dr. Liebrick, an eminent oculist and lecturer at St. Thomas's Hospital, on astigmatism and colour-blindness, with special reference to the works of Turner and Mulready. As I have the advantage of somewhat abnormal vision, akin to that attributed to those artists, I may perhaps be able, if not to throw light upon this subject, at least to offer some colourable solution of the problems.

Astigmatism was defined to be imperfect focalization, or inability to concentrate the rays of vision so as to give a defined image; and colour-blindness as "a congenital defect of vision characterised by the absence of one of the primary sensations of colour."

In regard to Turner he said:—"Till the year 1830 all is normal. In 1831 a change in the colouring becomes for the first time perceptible, which gives to the works of Turner a peculiar character not found in any other masters." He then traced the supposed optical changes in the eye, which at first "only affected natural objects where the light is strong enough to produce this disturbing effect, whilst the light of his painting was too feeble to do so; therefore the aspect of nature is altered, that of the picture correct. Only within the last years of Turner's life the dimness had increased so much that it prevented even his seeing his pictures correctly. This sufficiently accounts for the strange appearance of his last pictures, without its being necessary to take into account the state of his mind.

"The fault is a vertical streakiness which is caused by every illuminated point having been changed into a vertical line. The elongation is, generally speaking, in exact proportion to the brightness of the light; that is to say, the more

intense the light which diffuses itself from the illuminated points in nature, the longer becomes the line which represents it in the picture. Thus, for instance, there proceeds from the sun in the centre of a picture a vertical yellow streak, dividing it into two entirely distinct halves, which are not connected by any horizontal line. In Turner's earlier pictures the disc of the sun is clearly defined.

"It may seem hazardous to designate a period as diseased, the beginning of which art critics and connoisseurs have considered as his climax. I do not think that the two opinions are in decided contradiction to each other. To be physiologically normal is not at all a fundamental condition in art; and we cannot deny the legitimacy of the taste which regards that which is entirely sound and healthy as commonplace, trivial, and uninteresting, and which, on the contrary, is fascinated by that which approaches the border of disease, and even goes beyond it." He goes on to state that some good judges admire Beethoven's compositions best after he had become rather deaf.

"Was the great change which made the painter of 'Crossing the Brook' afterwards produce such pictures as 'Shade and Darkness,' caused by an ocular or cerebral disturbance? Researches into the life of Turner could not afford an answer to this question. All that I could learn was, that during the last five years of his life his power of vision, as well as his intellect, had suffered. In no way, however, did this account for the changes which began to manifest themselves about fifteen years before that time. The question could therefore only be answered by a direct study of his pictures from a purely scientific, and not at all from an æsthetic or artistic, point of view."

I question the correctness of this solution, inasmuch as the supposed defects are discoverable long before the date assigned for their commencement. As early as when Turner supplied sketches for the plates of the Oxford Almanac, the publishers broke off the engagement, on the ground that they were not sufficiently accurate. I have seen some of the originals in the Oxford School of Art, and the deviations from any prosaic copying of nature are unquestionably intentional. The same may be said of the plates in his *Western Scenery*; and I would specially call attention to an instance of this in a view on the Seine in *Turner's Annual Tour*, published in 1835. On comparing this with the photograph, it will be seen that the arches of Pont Neuf are more than double the height, although nearly the same breadth as they are in reality. This sketch

of the same subject, which I took a few months ago, is in the happy mean between nature and high art !

The want of definition in the lights was also, I believe, intentional; the *ignotum pro magnifico* enters largely into art. Aerial perspective must always be exaggerated in order to give the effect of distance on a flat surface; and even the mathematical rules of linear perspective must be made a little elastic if we would convey to the mind the true proportions of nature. Berry Head, as seen from Torquay, is a mere line in a photograph, or a diminishing mirror—an effect which is often erroneously attributed to the lens. The brightest tone in a picture is white paper. To give this the dazzling effects of light, it is necessary to have recourse to some such means as are attributed to astigmatization, either in tint or tone.

The eye cannot help comparing the actual proportions of real objects, instead of those which they bear on the perspective plane; the angle subtended may be the same, but this is not taken as the only measure. I had an instructive instance of this at a School of Art meeting, when a large class of children attempted to sketch my house. Nearly all of them made the distant objects very much too large, and some even inverted the angle of the chimneys. They had been instructed only from flat copies in decorative art. The child cries for the moon, and tries to reach it; and the sun during a total eclipse looks 'no bigger than the moon,' but the educated eye mentally continues the lines, until the actual diameter at their base is in some measure realized. Art has to supplement this, especially in small or short-distanced pictures, which, unless held very near to the eye, do not cover that portion of nature they represent. Turner's suns are generally twice the size of his moons, and these are at least double that of nature.

The same principle runs through every branch of art. Turner's lengthened reflections are only the counterpart of the long drawn aisles and lofty spires of the architect, or the protracted cadences of the musician and ecclesiastical intonations. The wonderful pyramids, or rather obelisks, in ladies' headgear, and philosophers' beards, are all on the same principle; and the eyelash in our *Book of Beauty* is always lengthened downwards; in China, possibly, Turner's astigmatism would have been "abnormal refraction in its horizontal, instead of its vertical, meridian." Under the influence of cotemporary Ruskins, this soon became mannerism; but the principle is, I believe, sound artists' license. I always think it fair, in measuring with the pencil, to sweep the arc rather

than the perspective plane, thus diminishing the horizontal length of objects at the sides of the picture which is rarely seen at its true distance, so as to produce the same effect by contracting the angle of vision.

In regard to colour-blindness, the lecturer instanced Mulready. "The primary sensations of colour," he says, "are red, green, and violet, according to Thomas Young and Helmholtz; or red, green, and blue, according to Maxwell." "But we meet with slighter degrees of colour-blindness where the perception of red is not entirely wanting, but only considerably diminished; so that, for instance, an intense or strongly illuminated red can be perceived as such, whilst a less intense red appears green. At the last year's exhibition the roofs of houses were all painted red on the sunny side, green on the shadow; but what particularly struck me, the oxen also were red in the sun, green in the shadow."

"Patients on whom I have operated for cataract very often spontaneously declared, immediately after the operation, that they saw everything blue; in these cases I invariably found their crystalline lens to be of an intense yellow colour. In pictures painted after the artists were considerably over sixty, the effect of the yellow lens can often be studied. To me their pictures have so characteristic a tone of colour, that I could easily point them out while passing through a picture gallery. As a striking instance, I will only mention Mulready. It is generally stated that in his advanced age he painted too purple. A careful examination shows that the peculiarity of the colours of his later pictures is produced by an addition of blue. Thus, for instance, the shadows in the flesh are painted in pure ultramarine. Blue drapery he painted most unnaturally blue. Red, of course, became purple. If you look at these pictures through a yellow glass, all these faults disappear. When I had the pleasure of showing this experiment to Professor Tyndall, he drew my attention to the fact that one single colour, namely, the blue of the sky, was not affected by the yellow glass. The blue of the sky was almost the same in both pictures (namely, 'The Brother and Sister' and 'The Young Brother,' in the Kensington Museum, painted, one in 1836, the other in 1857). The fact is, it is impossible to change the first picture so as to form a colour that looks like it when seen through a yellow glass. If more white is added, the sky becomes too pale; if a deeper blue is added, it becomes too dark. Mulready was thus forced to content himself by giving to the sky in his later pictures the same colour as in the earlier ones."

If I may believe the testimony of other people's eyes, mine are defective in the perception of the red instead of the blue ray ; and I believe colour-blindness will always be found at one end of the spectrum, not, as stated by the lecturer, of the yellow or any other intermediate colour. As the drum of the ear, which is attuned so high that it cannot respond to the low notes, is proportionately acute to the high, and *vice versa*, so, I believe, the optic nerve is sometimes so strung as to synchronize only with the corresponding undulations of light. The former of these may be proved by experiment. I remember once being in Kensington Gardens with Professor Tyndall, when we could hear the grasshoppers by closing the nose and mouth, and tightening the drum of the ear by blowing through the eustachian tube, but we were then unable to hear the rumble of distant carriages.

Mulready's later colouring was probably assigned by the lecturer to the true cause. It is more intelligible in regard to colour than to form that the higher lights should in nature produce an effect which is not perceptible, unless artificially counterfeited, on the canvas. Turner could not have forgotten that the moon was round as he saw it in his younger days ; but Mulready might not have perceived in his ultramarine anything more brilliant than the colours in nature.

In regard to the other artist referred to, who painted his red cows green in the shadows, reflected light always partakes of the surrounding tints, and a blue green is not altogether inadmissible. The azure of the sky is constantly seen on the bright reflections, especially of Sir Francis Grant's well-groomed horses ; if it was yellow-green, the artist must have been colour-blind to one of the central tints of the spectrum, of which I have never met with an instance. I have often found, by looking at a drawing by candle-light, that I had used red for shadows on grass. I remember once mistaking pure lake for neutral tint. The flowers of *Pyrus japonica* are to me almost undistinguishable from the leaves ; so also by daylight are some varieties of fuchsia and camellia. If I were to paint a scarlet geranium in monochrome, I should make the flowers light upon a middle tint leaf ; but as evening approaches the scarlet becomes a velvety black, whilst the leaves remain almost unchanged, both in tint and tone. Blue continues light until long after sunset, when every other colour has almost disappeared. My scale of colour is precisely that of Dalton, as shown in a manuscript illustrated by colours, sent to me by the late Sir John Herschel.

In the preceding remarks I have assumed that the undula-

tory theory is applicable to light and colour as it is to sound. Possibly, also, the range from red to violet might be seen repeated in higher and lower octaves of the same colours if there were optic nerves tuned sufficiently high and low to take up their vibrations. This seems to be suggested by the occurrence of red blended with blue in purple or violet. But this theory is not supported by the experiences of colour-blindness, the red rays being as imperceptible at one end of the spectrum as at the other, purple, lilac, and violet, appearing merely as shades of blue. In the higher octave the chemical or octinic ray ought to appear brighter than scarlet, and below the red of the ordinary spectrum there should be a deep bass blue. The more probable theory is that the prismatic colours form a circle, violet being intermediate, if a pure colour, between blue and red.

SOME NOTES ON THAT PART OF MR. CHANTER'S PAPER RELATING TO THE INSECT FAUNA OF LUNDY ISLAND.

BY R. PARFITT.

(Read at Exeter, July, 1872.)

IN Mr. Chanter's paper, published last year in our *Transactions*, on the "History of Lundy Island," he necessarily included the Fauna and Flora. To a section of the former, namely, the Coleoptera, I wish to make a few observations. Mr. Wollaston, one of the best coleopterists in Europe, was the first, I believe, to draw attention to the then supposed peculiarities of the Coleopterous Fauna of Lundy. In the *Zoologist* for the years 1844-47, Mr. Wollaston enumerated 153 species of beetles, which at first sight appears a large number for so small a space— $3\frac{1}{2}$ miles long by about half a mile wide.

In 1869 Mr. F. Smith, of the British Museum, visited the island, and he not only verified most of those collected by Mr. Wollaston, but he added six more species to the list, bringing the total up to 159.

Mr. Wollaston says, that "having collected for some months in Devon, particularly about that part of North Devon nearest to Lundy, he expected to find species that swarmed about Clovelly, Westward Ho, &c., on the island; but out of a dozen of the most abundant species on the mainland he had not found a single example, whereas such as he had never observed in any part of Devon were in abundance at Lundy."

Mr. Wollaston gives an example in *Cetonia aurata* as found on the island; and Mr. Smith has also taken it there. These gentlemen, it appears, have never met with this insect on the mainland of Devon; but I have seen a great many taken at Torquay, and a few have also been taken in gardens around Exeter. Examples of these are in my cabinet; and in my *Catalogue of Devon Coleoptera*, page 65, this species is stated to be taken "at Torquay in plenty some seasons."

At Tenby, on the Welsh coast, Mr. Wollaston met with
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those species in profusion that he found on the island, and which were not met with by him on the North Devon coast. One remarkable instance is given in *Cteniopus sulphureus*, which is abundant at Tenby and on the island ; this has never, so far as I am aware, been found on the mainland of Devon. Now this is not an apterous species, or it might be supposed to have been carried to the island from the Welsh coast in soil round the roots of plants or otherwise ; but the insect is provided with ample wings, and may have been blown across in a westerly gale. The nearest land on the Devonshire side is Hartland Point, a distance of eleven miles and six furlongs ; and it is about three times the distance from the Welsh coast, or thirty-three miles. Now this is a very remarkable fact, and, I think, goes far to prove that the parent or parents of the Lundy Island specimens must have reached the island through human agency. At the same time, it is very remarkable that the same agency should not have introduced the insect into Devon. Although not found in Devon or Cornwall, it is not confined to Lundy Island and the opposite Welsh coast, but is found at Dover, Norfolk, Gog-Magog hills, &c. The same applies to *Sarrotrium muticum*; it has not up to the present, I believe, been taken in Devon ; but it is taken in the neighbourhood of London, Norwich, Burnham, &c.

Orobites cyanus and *Otiorhynchus rugifrons* are two other species mentioned by Mr. Wollaston as not found in Devon ; but since this gentleman worked up his lists I have added the Orobites to our Devon insects, and the Otiorhynchus has been taken on Woollacombe Sands by Dr. Power.

Now, to push this investigation still farther, I think we shall be able to reduce the number of species found on the island as compared with those captured on the mainland of Devon.

Taking, then, Mr. Wollaston's list of 153, and Mr. F. Smith's addition of six species, we have a total of 159 for the island. In my *Catalogue of Devon Coleoptera*, published 1867, I did not include the Island of Lundy, and, exclusive of this, I have enumerated 1170 species ; to this must be added 26 species discovered since ; bringing the total of the mainland species to 1196.

Out of this number 47 of those species which were supposed to be confined to the island have been found on the coast of North Devon, and 76 others have been taken in South Devon, making a total of 123 of those species supposed *not* to be found upon the mainland. This, then, leaves 36 species for the island not yet found on the mainland of Devon.

Mr. Chanter mentions the occurrence of *Calosoma sycophanta* on Lundy Island. This insect cannot be considered indigenous to the British Isles ; it is a creature of a warmer clime, and, like the *Locusta perigrinus* and *migratorius*, they occasionally find their way here in the warmth of summer. I have carefully examined the published lists of Coleoptera found on the island, and I can find nothing there but what has been met with in other parts of the British Isles ; it therefore forms no exception to the mainland. The chief and perhaps its only peculiarity is (and this must be taken provisionally), that its Coleopterous Fauna is more Welsh than Devon ; and this, I think, is probably due to the prevailing westerly winds.(?) Some species may have been imported in the egg, larva, or in the image state in merchandise, or, what is more likely, in earth round the roots of plants. So far as is known, and this is a curious fact, there appears to be an entire absence of what may be termed the domestic species ; that is to say, no species of *Anobium* or *Bruchus* has been found—those species generally found in houses, granaries, and other buildings, in stores of grain, &c. There is, as might be expected, an entire absence of the *Xylophagi* ; but there being no trees, or comparatively none, on the island, this is not to be wondered at.

The prevailing species found on the island belong principally to three very natural groups—the *Carabidae*, the *Geotrupidae*, and the *Phytophagidae* ; and, as might be expected, the last group is the largest.

From what I understand from an examination of this Fauna, it would at first appear that the island had once been attached to the coast of Wales, as the Coleopterous insects are, or appear to be, more Welsh than Devon ; but as we have reduced the island species from 159 to 36, this makes it very probable that by more diligent research the numbers may be still more reduced. If, then, the island of Lundy was once attached, or that the coast of Wales was once nearer to Lundy than at present, this would open up the question as to the probable time when this was the case, and also what is the cause of the wearing away of the Welsh shore so much faster than the shores of Devon. Geologically, Lundy belongs to neither shore ; but lithologically, as well as proximitively, it comes nearer to Devonshire and West Somerset than to any other within our area. At the same time little dependence, geologically speaking, can be placed on intrusive rocks, as they are of all ages.

It would be exceedingly interesting in a physiological point of view to examine some of the more abundant or common

species, to see if the isolation and their narrow limits have caused a corresponding diminution of their organs of flight. This has to a certain extent been the case in the islands of the Atlantic, Madeira, Teneriffe, and the Cape de Verds, as stated by Mr. Wollaston in his examination of the Coleopterous Fauna of these islands; at least (this gentleman writes me, in answer to the question I put to him, If he had observed any diminution in the wings of the Lundy Island forms?) "there seems a little evidence in its favour in the Atlantic archipelago (or at least there are facts which may or may not be cited as evidence), but I am bound to say that I cannot but fear that too much has been made of it, and that it certainly (if tenable at all) ought not to be pressed too far, or insisted upon as a matter which is in any degree capable of proof."

The most remarkable feature noticed in the Lundy Island specimens, and which bears upon the question of variation through limited range, isolation, or variety of food, and other local influences, is, that the species of Coleoptera of Lundy Island showed a manifest tendency to become paler or more testaceous in hue than the same species with a comparatively unlimited range, and with the same application as regards food, &c. Mr. Wollaston adds, "as though effected in some way by the saline nature of the atmosphere and the chemical properties of the plants *Sinapis* and *Cacala*, tribes on which they mostly subsist. This was conspicuous particularly in *Psylliodes* and *Ceuthorhynchus contractus*," &c. &c.

Coleoptera vary somewhat in size, even when surrounded with all the necessities of life, and those in the greatest profusion; so that we cannot detect any difference in this respect in the island forms, although it is one of those things which would at first sight seem to be more conspicuous than it really is and one which intrudes itself upon us when we see the paucity of the vegetable productions; and if the herbivorous are depauperated, this would also limit the development of those which prey upon them—the carnivorous.

My friend, Mr. F. Smith, of the British Museum, having visited the island several times, principally in search of *Hymenoptera* and *Coleoptera*, has kindly placed in my hands the result of his investigations. To his captures of Coleoptera I have already alluded, as additions to Mr. Wollaston's lists.

The island presents no peculiarities as regards the Hymenopterous Fauna from that of the mainland of Devon, with a single exception, and this may be considered an artificial and not a natural one. The exception is this, it is an extremely rare thing for a hymenoptorist to collect the objects of his

pursuit long without meeting with the common *Apis mellifica*, or hive bee ; but, curious enough, this almost cosmopolitan insect has not yet found its way to the island of Lundy. The probability is that, from the stormy locality of the island, this little domestic species cannot hold its own there ; or that there is not sufficient food for this insect to subsist on ; or that the flowers of such plants as can hold their own are so impregnated with salt from the sea spray that the food is not palatable.

The following is a list of the species of *Aculeate hymenoptera* taken by Mr. Smith :—

<i>Formica fusca</i>	<i>Sphecodes subquadratus</i>
" <i>nigra</i>	<i>Halictus rubicundus</i>
" <i>flava</i>	" <i>cylindricus</i>
<i>Myrmica ruginodis</i>	" <i>flavipes</i>
<i>Pompilus gibbus</i>	" <i>morio</i>
<i>Odynerus gracilis</i>	" <i>minutus</i>
" <i>trimarginatus</i>	" <i>pubescens</i>
<i>Vespa sylvestris</i>	<i>Nomada Jacobaea</i>
" <i>vulgaris</i>	<i>Bombus leucorum</i>
<i>Colletes succincta</i>	" <i>hortorum</i>
<i>Sphecodes gibbus</i>	<i>Apathus vestalis</i>
" <i>rufescens</i>	

NOTES ON THE ROCKS IN THE NEIGHBOURHOOD OF PLYMOUTH:

BY R. N. WORTH.

(Read at Exeter, July, 1872.)

THE group of rocks in and around the Three Towns presents features not only peculiarly interesting in themselves, but which may be regarded, if not in all respects typical, as at least illustrative, of the geological phenomena of other portions of South Devon. We find associated within an area three or four miles in length, and about the same in breadth, a remarkable variety of strata, very dissimilar in character, but yet appearing to form portions of a fairly defined series. A few general observations upon the conditions under which they occur, and what appear to be reasonable inferences therefrom, are contained in the present paper.

Roughly what, for sake of the distinction, we may call the Plymouth group, may be said to consist of four classes of rock—slate, limestone, sandstone, and trap; the three former presenting the general characteristic of a high southerly dip, varying considerably in angle, but rarely in direction more from S. than S.S.W. or S.S.E. The general order of superposition from north to south is slate, limestone, and sandstone, which, I think, we may regard as indicating three distinct periods in the geological history of the locality. That is, we may assume that the bulk of the slate was first deposited; next, the mass of the limestone; and finally, the greater portion of the sandstone. But there is no hard and fast line between them. On the contrary, there is abundant evidence of the contemporaneous deposit of portions of each. The limestone graduates into the slate, and the sandstone is interstratified with either, in such a manner as indicates beyond controversy that the passage from one period to another was a continuous work of time; and that whatever abrupt changes have affected the rocks under review were due to exterior or subsequent causes. Still, this triple division suggests itself as not only convenient but correct, as signifying that the stratified rocks of Plymouth are the results of three distinct and suc-

cessive forms of operation—first, the formation of the mud banks, which are now consolidated into the older portions of the shales; second, the building of the coral reef, which constitutes in one respect the nucleus, and in another the source, of the limestone; third, the change of the nature of the detrital matter of the palæozoic river or rivers that flowed towards what is now Plymouth from an argillaceous to an arenaceous character. It being always borne in mind that these periods are united by links, resulting from the gradual—sometimes alternating—change of operation; and that the whole series has been disturbed and modified by volcanic action, manifested chiefly in a direction parallel to the line of strike.

Slate rock is the most common in the neighbourhood. It stretches from the granites of Dartmoor and Hingston Down to the northern edge of the limestone, with here and there an elvan, but without much appearance of trap until we arrive at the district under review. Near the granite the slate has generally a very small dip, averaging about ten degrees, and frequently more nearly approaching the horizontal. In the neighbourhood of Plymouth, however, from a cause hereafter to be noted, it dips at a very much higher angle. Taking different points from E. to W. north of the limestone, we find that at Cann Quarry it dips 65° S.S.W.; at Prince Rock 50° a little east of S.; at Stonehouse Bridge 60° S.; at Swilly 50° S.; at Carbeal the same; and at Trevol 70° . The average dip may be put at 60° ; whilst there are places, as at Ford Hill, where it is as much as 80° ; and others, as near the Devonport Workhouse, where it may be seen as low as 10° . These, however, are very local exceptions.

The bulk of the slate in the locality under notice is drab in colour, and somewhat earthy in texture. At Cann Quarry, and some other points, good blue roofing slate has been raised; and elsewhere we find it purple mixed with green. These remarks apply especially to the northern slates. On the south of the limestone the characteristics are not so distinct nor continuous; the beds are intermixed with shaly limestones, sandstones, and grits, in very irregular fashion, and, moreover, have been greatly disturbed. One very important local distinction between the northern and the southern slates is, that the latter frequently contain fossils; the former, so far as I am aware, never.

The Plymouth limestone forms a band half-a-mile in breadth, and stretching away nearly due east for several miles from its western limit at the Devonport Dockyard. Its general elevation is much lower than that of the slate hills—

averaging about a hundred feet; and whilst its summit line has been truly described as being level as a wall, its continuity is broken at several points. The Tamar, after rounding its western extremity, passes through it at Cremill; the Plym has a narrow channel at Cattedown; and at Stonehouse Pool, Millbay, and Sutton Pool, the waters of the Sound find access through the barrier to basins worn out of the slate rocks behind.

The limestone varies much in colour, structure, and dip. Its most constant features are its crystalline character, and the regularity of its divisional planes. Both on the north and south it graduates into the slate through calcareous shale. Bedding is frequently indistinct, and in some central parts of the mass apparently non-existent. It abounds in fossils—chiefly coralline in its more massive portions; whilst some of the exterior beds have yielded large quantities of bivalves and univalves; and others, with the adjoining slates, are remarkably fruitful in crinoidal remains. In texture it is generally highly crystalline, and in colour very various, ranging from black, through red, yellow, brown, and gray, to white. There is a marked increase of dip from north to south. Whilst on the northern edge the dip varies from 20° to 40° ; on the southern it runs from 60° to 75° —the latter at Mount Batten. On the south, as may be seen in the fine coast section from Mount Batten to Bovisand, numerous detached beds of limestone occur, interchanged with shale and sandstone. On the north no such phenomena are apparent, although at points the limestone may be observed penetrating the slate in the manner of veins. This was to be seen recently when Catherine Street, Plymouth, was lowered.

The whole of the sandstones are found to the south of the limestone band. They are best represented at Bovisand and Cawsand, the beds continuing across the Sound (I am not here alluding to the Triassic sandstone of the latter locality), and having the same general southerly dip. They are chiefly hard, crystalline, reddish brown, and, breaking freely into rhombs, are extensively quarried under the name of "Withy Edge Stone" for pitch paving. The limestone contains numerous veins of red sandstone, filling joints and fissures; but the sandstone beds immediately to the south of the limestone are chiefly gray and drab. Purple patches, occurring at first sparsely, gradually become the predominant character of the rock. It is not very easy to trace the exact order of the sandstone series, from the irregular manner in which the strata of grit, schist, limestone, and sandstone succeed each

other, with frequent intrusions of trap, and numberless contortions. To this point I hope hereafter to be able to direct more attention. So great is the confusion, that the late Mr. J. B. Jukes was led to suggest that the sandstone might really underlie the limestone. "If," asked he, "a slate bed," which he saw there, "could have been turned back upon itself, with no more evidence than the doubling of a band of quartz, why might not the same be true of 250 yards, or 2500?"

Without presuming to dogmatize upon such a point as this, I may be permitted to say that the evidence I have at present does not seem to support such a view. In the first place, it appears to me important to consider the fact that the limestone forms a division between the non-fossiliferous and fossiliferous sections of the group; or rather, perhaps, since it is itself fossiliferous, that it indicates the recorded commencement of life in the locality. In the next place, we have evidence of the more recent origin of portions at least of the sandstone, in the sandstone veins already noticed as occurring in the limestone. Nor is this all. Beds of red sandstone were discovered with the limestone in cutting away the rock for the Victualling Yard; and in boring for the Victoria Spa, near what is now the Railway Station, three feet of red sandstone were traversed at a depth of 190 feet—almost wholly through limestone; four feet at a depth of 243 feet, and twelve feet at a depth of 353. These figures do not, of course, represent the actual thickness of the beds or veins. The average dip would reduce their real breadth or depth to certainly half these dimensions; whilst, if they fill irregular cavities, any inference of dimensions would be delusive altogether. I refer to them to show that they really afford no foundation for the hypothesis of Mr. Jukes, which at first sight their occurrence may seem to favour.

Detached from the limestone, there are no indications of sandstone northward whatever. It is, of course, a mere truism to say, that either no sandstone can have been deposited there, or that it must have subsequently been removed. The depth at which the Dartmoor granite was formed, and its intimate connection with the surrounding rocks, afford convincing proof that the district has been subjected to a vast amount of denudation; but it does not seem to be a necessary inference that the Devonian sandstones were so removed over this particular area. It may have been that, during the local sandstone period, the land to the north of the limestone, though not the limestone itself, was above water.

This is not a mere random hypothesis. It is primarily to volcanic action that we owe the present configuration of the locality. The Three Towns area appears to have been a volcanic centre, and to have been subjected first to subterranean forces, operating with the greatest effect along an east and west line from Crabtree to St. Germans, immediately in rear of the limestone. Here the effect has been chiefly upheaval. On the southern side of the limestone we find produced, however, the contortions and inversions already referred to at Mount Batten. Probably it was the same terrible agency that sketched the outline of the Sound; whilst, if the northern upheaval occurred prior to the sandstone period, it is a fair inference that to it we owe the absence of sandstone rock on the north of the line of limestone.

The trap-rock, called locally, in conjunction with some of the altered slate, dunstone, occurs in various forms. Near the surface it is generally of a dun or a reddish brown, often vesicular, and commonly ferruginous—as the result of weathering. In depth it becomes bluish gray in colour, and very hard. Occasionally it is amygdaloidal, as at Ford, where it contains crystals of carbonate of lime; and here and there fragments of slate are imbedded. Its forms of intrusion are manifold. There is hardly a hill in the immediate vicinity of the Three Towns that does not contain a trappian nucleus, or is not wholly—as those at Ford, and the Devonport Town Hall, of that rock. To its superior hardness in resisting denudation, no doubt several of these elevations owe their present contour. Sometimes it forms ridges in the direction of the axis of upheaval; elsewhere we find it in veins. Occasionally it has forced its way between the layers of the sedimentary rocks; at other points it has filled fissures previously existing. The most interesting example of its occurrence may be seen in the railway cutting above Weard Quay, not far from Saltash. Here we find a series of layers of trap interstratified with slate, more than a score in number, and varying from an inch to three feet thick. And here, therefore, the lava must have spread itself upon the sea bottom in successive sheets, with comparative quietude, and at intervals sufficiently long to allow of the deposition of considerable layers of silt between.

Taking the whole of these phenomena together, they seem to indicate the special local influence of volcanic action, operating over a lengthened period. With the exception of elvan dykes at Roborough and Cann Quarry, there is little evidence of igneous action in the slates between Dartmoor and Plymouth on the east. On the northward the trap rocks break

off about Knackersknowle; but on the west they are continued at intervals so far as Menheniot, where rises the serpentine hill of Clicker Tor.

If I might venture without presumption to deduce from these data a brief physical history of our Plymouth rocks, I should first call your attention to a time when what is now South Devon, over the whole of which similar groups are scattered, was a land-fringing sea, into which some huge river or rivers discharged vast quantities of light detrital matter; forming the mud banks now consolidated into slates. How long that process went on we cannot say; nor if there was life in that sea have we any direct local traces of its existence, until the coral animals appeared upon the scene, and commenced the formation of a reef, which probably skirted the shore at a distance for many miles, and a remnant of which now constitutes the Plymouth limestone. They toiled for ages. While they were building, the deposit of silt and the formation of shale continued, and great additions were made to the thickness of the slates. We can only guess at the cause which led to the disappearance of the reef builders. Change of level may have rendered the spot untenable by them; or the water may have become too heavily charged with solid matter; but whatever the reason, at length they passed away. Even whilst they had laboured their works had been overthrown. Storms had shattered fragments from the reef, and the action of the waters had reduced them to powder, which filled the interstices, or was thrown down around. When the restorative power ceased to be exercised, this process went on with increased vigour. Little by little the exposed portions of the reef were ground down by the slow, resistless action of the waves into calcareous mud, and a new system of deposits formed on and around its site, wherein sometimes the calcareous, sometimes the argillaceous, element predominated. For all this while the streams never ceased to yield their quota to the new formation, which now entombed the remains of the molluscs and crinoids wherewith the waters teemed. The fact that the reef was the axis of the calcareous deposits, which in relation to it would be slightly convex, appears to explain their increased dip southward, and their unconformability to the slate proper already noticed.

Hitherto water, air, and life, had been the agents at work. A new one was about to appear, and convulsive throbs heralded the advent of a volcano. For miles the strata were tilted towards the south; and, less compact than the limestone, the slate gave ready passage to the lava. But the resistance

of the limestone was limited. If not bent, it could be broken; and fissures were opened therein, that, in the course of untold ages, have been worn into the channels through which pass, or once did pass, the waters of the Tamar and the Plym. Had not these fractures been made, had the waters been set the task of forming their own courses *ab initio*, the slates would have been an easier prey, and we know that nature never wastes her strength. The gorge of the Plym at Prince Rock has a depth of 80 feet below high water mark, before the rock is reached, which there is shale. With slate rocks around, would the limestone have been thus cut, if the passage had not first been opened?

The contour of the coast was now changed, but yet the land paid tribute to the sea, though the character of the deposit was modified. The waters still brought down silt, but occasionally were charged instead with sandy matter—we may see similar alternations in streams now; and the degradation of our old friend the coral reef continued, although, perhaps, in a more casual and less systematic fashion. And so we find layers of shale, and limestone, and grit intermixing, until the arenaceous influence predominated, and the mass of the Bovisand beds were formed—fresh manifestations of volcanic power at intervals disturbing the order in which the constructive force of nature worked, and laying the foundations of the future by tracing out the Sound.

Here, for the present, at the limits of the system upon which I desired to offer these few notes, I pause. There is little evidence of the extent to which construction was exercised subsequently over the area under review. Mighty works were doubtless done, of which we have scarcely a trace. Denudation has wiped away countless ages, and brought us face to face with these old Devonian times. We have now but the skeleton of the deposits of that far distant epoch; yet that skeleton we are enabled somewhat to clothe with flesh, and, though in feeble fashion, to make the dry bones live.

Hereafter I trust I may be enabled more worthily, and with fuller detail, to return to this subject.

RECORDS OF TIDE, RAIN, AND WIND, DURING THE CARBONIFEROUS PERIOD IN NORTH DEVON.

BY TOWNSHEND M. HALL, F.G.S., ETC.

(Read at Exeter, July, 1872.)

IN the great trough of culmiferous rocks extending from Barnstaple on the north to Dartmoor on the south, it is by no means an unusual occurrence to meet with surfaces of either grit or slate covered with rippled markings, precisely similar to those which are left at the present day by the receding tide upon a modern tract of mud or fine sand.

These marks may be said to be almost universally found throughout the carboniferous system of the district; but two or three localities near the town of Bideford are especially worthy of note, as exhibiting them on a large scale. In the Devonian rocks they occur frequently in the Pilton beds, and form a striking feature in the cliff scenery on the south side of Baggy Point. In a less degree similar ripples may be traced nearly everywhere throughout the North Devon rocks, whilst in other parts of England they are to be met with in the slates and sandstones of almost all formations, from the oldest to the most recent, affording evidence that one of the same physical agencies now in constant operation, and which are effecting a gradual alteration over the whole face of the earth, is a thing of no new creation; that tidal action, and all the combination of forces necessary to produce the tides, existed then in the Palæozoic times as they exist now, though perhaps in a somewhat different degree.

Rain marks, on the other hand, are comparatively of rare occurrence. They are occasionally found in the Keuper sandstones and in the carboniferous grits of the North of England, also in the Silurian rocks of Wales, showing that even in these early periods of the world's history the several conditions requisite for the precipitation of moisture in the form of rain were in operation just as they are at present.

The reason that these marks are not more commonly found will be apparent when we consider the chances against the

preservation of such a transitory thing as the imprint of a rain-drop.

On watching the effects of rain upon the sand of a modern sea-shore or the mud of a river, it will be seen, in the first place, that a continuance of the falling drops for even ten or fifteen seconds is generally sufficient to cause the drops to run into and obliterate each other, ultimately restoring to the mud its original smooth surface; thus rain, however heavy, generally fails to leave behind it any marks to record its descent.

In the case of a sudden passing sun-shower, or the large drops which proceed from the tail of a thunderstorm, the result is the formation of a few single and well-defined imprints of a cup-like shape, and these, I believe, are the only circumstances under which impressions of this character can be produced.

Even when made, the chances against the preservation of such markings must necessarily be very great, since they must first have become hardened and dried by exposure to the wind or sun before the next rise of the tide, which is to coat them over with another layer of sediment.

Thus it will be seen that, in comparison with the ripple marks (two sets of which may, under the most favourable circumstances, have been formed within twenty-four hours)—the improbability of finding successive sets of rain marks in the same locality would be extreme, and the chances against such coincidences would obviously increase in a very high ratio with every additional imprint which may be discovered.

Some specimens of dried mud, exhibiting two different sets of rain markings, were lately shown to me by Sir Charles Lyell, who obtained them in the Bay of Fundy; but I am not aware that any similar coincidence has been noticed in other localities, or that the existence of rain marks in the Devonshire series of rocks has yet been placed upon record.

During the last meeting of this Association I observed, whilst walking along the new line of railway from Bideford to Torrington, a thin fragment of slate lying amongst the packing, or ballast, on an embankment, and bearing on its surface a number of imprints, which in size, shape, and general appearance, were precisely similar to those occurring in the Keuper sandstones, and which are universally ascribed to rain. The cutting from whence the stone was taken was found to be not far distant, being situated on the site of the present station in that part of Bideford which is known as "East-the-Water."

On closely examining each surface of the carboniferous slates through which the cutting had been made, the whole series of beds were found to be lifted up on end, and occupying either a vertical position, or dipping south at a very high angle. A few yards south of the anthracite or culm beds, which here run beneath the town, the slates consist of thin laminæ; they are highly indurated, and cleave readily, coming out in slabs of considerable dimensions.

At the north end of the cutting a series of three successive rippled surfaces were exposed to view, and in proximity to these I found slabs of the slate covered more or less thickly with the rain marks, as I then supposed them to be, identical in every respect with those on the fragment which had first attracted my attention on the embankment.

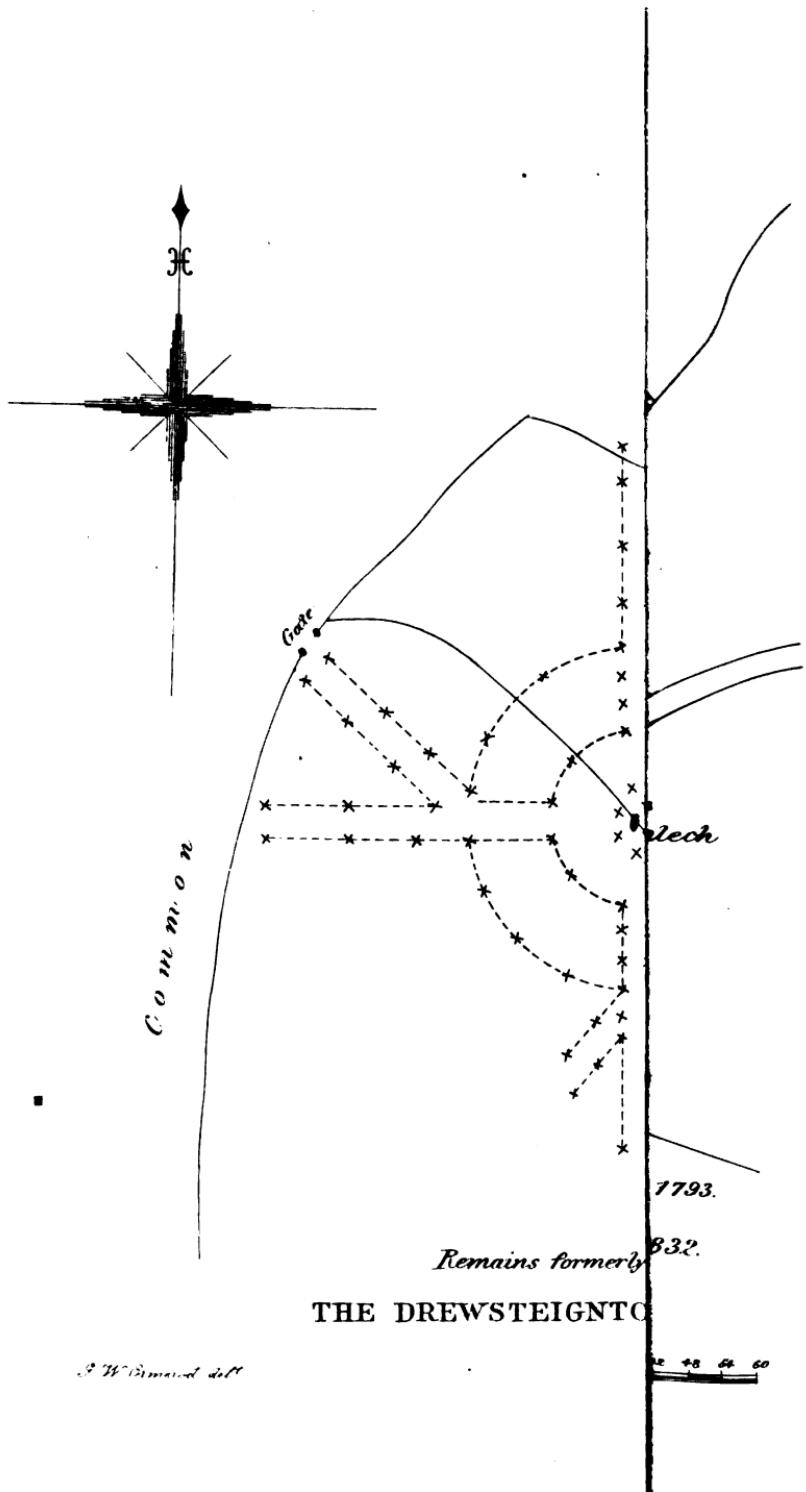
On the following day I had the opportunity of showing these marks *in situ* to several of the members of this Association.

In outward appearance the marks may be described as depressions or cusps, sometimes oval, and sometimes circular, ranging in size from a diameter of one-tenth of an inch to half an inch. Their distribution over the surface of the stone varies with their size, and in the case of the smaller markings there were as many as 640 on a square foot of slate; on another slab there were only 108; whilst intermediate sizes numbered 184 and 352 respectively per square foot. The depressions on the one surface of the slate were filled by corresponding protrusions or casts on the adjoining layer; and it is worthy of notice that the majority of the marks had one side of the rim surrounding the depression a little more elevated than the other, apparently indicating that the descending substance, whatever it may have been, fell upon the soft mud at an angle, and not vertically.

The first opening for any doubt regarding the pluvial origin of these marks was afforded by a second visit to Bideford a few weeks later, when further progress had been made with the cutting. On this occasion I counted more than twenty distinct surfaces covered with imprints, which were sometimes in close proximity to each other, and sometimes separated by a number of intermediate layers of smooth slate. The absence of any rolls or contortions in the strata showed that there could be no repetition in the sequence of the beds; and taking into account the conditions involved in the formation of a single imprint, it was evidently improbable in the extreme that so many sets of rain marks following immediately one on top of the other could have been preserved in the same locality.

The next ground for doubt was the occasional existence in some of the depressions of a small gritty nucleus, more or less angular in its character, and considerably harder than the matrix in which it was embedded. A transverse section, on being polished, afforded, moreover, traces in some of these particles of oxide of iron.

The conclusion which I have hence been led to form regarding the origin of these marks in the Bideford slate is, that they are due, not to rain, but to showers of drifting sand, the finer particles of which, borne upon the wind, had fallen upon soft mud. The prevalence of sand drifts is too well known to require description. The distance to which their influence may be felt sometimes extends to more than 20 miles. During certain winds the deposition of the sand may have taken place as frequently as the formation of ripple marks; that is to say, once each tide; and the constant recurrence of such drifts, after the disposition of successive layers of tidal mud, would appear to be the only means to account for the markings which I have now endeavoured to describe.



NOTICE OF PRE-HISTORIC REMAINS FORMERLY
EXISTING NEAR THE DREWSTEIGNTON
CROMLECH,

OBSERVED BY THE REV. R. POLWHELE PRIOR TO 1793, AND MAPPED
BY THE REV. WILLIAM GREY IN 1838.

BY G. WAREING ORMEROD, M.A., F.G.S.

(Read at Exeter, July, 1872.)

THE questions "by whom" or "for what purpose" the Drewsteignton Cromlech was erected will be carefully avoided; the sole object is to record the very extensive Circles and Avenues which formerly existed there, and which have been now removed.

Polwhele, in his *Historical Views of Devonshire* (1793), vol. i. page 61, and *History of Devon* (1797), vol. i. page 150, when describing the Cromlech at Drewsteignton, writes thus: "Towards the west of the Cromlech are several conical pillars, about four feet high. On the south side there are three standing in a direct line from east to west. The distance from the most western to the middle is two hundred and twelve paces; from the middle to that on the east one hundred and six—just one-half of the former; by which, it would seem, that an intermediate pillar at least had been removed. In a parallel line to the north are two others, remaining erect, the one from the other distant about fifty-two paces—nearly one-fourth of the greatest space on the opposite line. The area between is ninety-three paces, in the midway of which, at the eastern extremity, stands the Cromlech." He further adds, in the *Historical Views* (page 94), and *History of Devon* (page 154): "At Drewsteignton the Cromlech is placed on an elevated spot overlooking a sacred way, and two rows of pillars, and several columnar circles."

In 1807 Mr. Samuel Lysons visited and took a drawing of the Cromlech; and, prior to 1830, Mr. Rowe examined the district; but neither of them allude to the existence of any remains near the Cromlech. Early in this year (1872) Mr.

King, of Crediton, wrote to me, asking if I was aware of the existence of certain remains near the Cromlech which had been mapped by the Rev. W. Grey, now of Exeter, in 1838. During my residence at Chagford, from 1855 to 1869, I had carefully examined the fields near the Cromlech, where I thought these remains had existed, in the endeavour to discover them; and Mr. King informs me that he had done the same; but our researches had been in vain, and no person remembered their existence. Mr. Grey has kindly given all the information in his power, and the following description is copied from his journal containing the notes taken on the spot:—

"Wednesday, 4th July, 1838. Visited first, from Moreton, the Druidical Circles above the Cromlech. The Cromlech lies in a field about one hundred and ten yards to the east. Here are two concentric circles of stones, the inner circle having entrances facing the cardinal points, that to the north being sixty-five paces in length and five broad. The outer circle, besides these, has avenues diverging towards N.E., S.E., S.W., N.W.; a smaller circle seems to intersect the larger, of which the avenue eastwards is very evident."

. The plan was made by Mr. Grey and his brother on the spot, on the morning of July 4th, 1838, and was completed by him on the evening of the same day at Okehampton. These remains are, doubtless, the "Sacred Way," the "two rows of Pillars," and "Columnar Circles," noticed by Polwhele. As Mr. Grey does not mention the pillars to the north and south of the Cromlech, it is probable that the work of destruction had commenced before his visit. The remains mapped by Mr. Grey were situate on the westerly side of the Cromlech, on the land now occupied by two fields; in the most easterly of these no large stones now are seen, in the adjoining field many stones remain near the gate to the common, and in the upper part some are seen which possibly formed part of these circles and avenues.

By permission of Mr. Grey, his plan has been reproduced on a larger scale, and the stones described by Polwhele have been also inserted. As the distances are given in paces, the map cannot be considered strictly correct. A pace has been taken as a yard.

IS THERE EVIDENCE OF GLACIAL ACTION IN THE VALLEYS OF DAWLISH AND ASHCOMBE, SOUTH DEVON?

BY GEORGE PYCROFT.

(Read at Exeter, July, 1872.)

THE little stream which falls into the sea at Dawlish, and which the inhabitants of that place have made the most of by widening and damming with artificial weirs, is so small and unimportant that it has never received a name. It is about six miles long, four feet broad, and deep enough in some places to allow a duck to float without touching bottom. But insignificant as this streamlet is, it has in the lapse of ages cut its way so deeply through the rocks over which it originally flowed, and has thus exposed such interesting geological sections, that I have carefully traced it from its one mouth to its five sources, and have endeavoured to learn from babbling brook the secrets of the valley. The vale of Dawlish is a continuation of that of Ashcombe. They are valleys of denudation, scooped to a depth of seven hundred and odd feet in the new red sandstone. They are shut in from the south, west, and north-west, by Little and Great Haldon hills, which rise to the height of 850 feet. The new red sandstone of these hills is capped with gault about ninety feet in thickness, and this again by a layer of flints without chalk. In the valley itself the new red sandstone is covered with a layer of superficial deposits, through which the brook has cut its way, and of which I shall have more particularly to speak.

The stream rises from five sources. The principal source is at Grammercombe, in Great Haldon; a smaller source exists at the Thorn's Plantation; a third at Charnwood; a fourth at the side of Little Haldon, below the Tower Plantation; and the fifth at Lidwell Chapel. There is also a very small tributary at Dawlish water. These sources have certain characters in common. They all arise at the junction of the permeable green sand and the denser new red sandstone, flow

precipitously down the sides of Haldon, cutting their way deeply through the new red sandstone rock, then through a mass of superficial deposits resting on the red, and so find their way to the bottom of the valley.

Commencing from the mouth of the stream, and tracing it upward, I find the first mile converted into an artificial piece of water, and containing nothing to chronicle. Above this, at the commencement of Luscombe grounds, the water has cut through the rock, leaving escarpments above twelve feet in depth, showing a confused mass of gravel, with very little signs of stratification. Here in the stream itself, and the fields adjoining, many boulders of porphyritic trap are met with, some three feet across, some less. At this point the tributary from Lidwell Chapel joins the main stream, and tracing this upwards, I find for the first two miles the streamlet flowing in an artificial channel. At Higher Southwood Farm blocks of trap are very common in the farm-yard and in the road adjoining—one block, about four feet in length, has been hollowed out, and converted into a drinking trough for cattle. Farther up the stream, at a height of 271 feet above the sea level, is situated Lidwell Farm, and in a field just above is the second largest boulder I have met with, measuring 15 feet in circumference. As the stream is followed up, many more are observed in the fields; and far above Lidwell Chapel, at a height of 702 feet, is a large rounded boulder, the highest I have met with anywhere in the valley. A little lower down another lies on the surface, measuring about 12 feet in girth. I met with no limestone in any part of this stream; but some parts are so difficult to get at, that I cannot say with certainty that none exists there. Returning to the main stream at Luscombe, I find it flowing through an alluvial valley, showing nothing worthy of mention, except that at Dawlish water there are a great number of the trap boulders in the banks, roads, and fields. A small tributary here joins the stream, and on following it up to its source on Little Haldon, I find that it has cut its way through a ravine 20 feet and upwards in depth by 50 in width; but as its sides are clothed with vegetation, a good section is not anywhere to be obtained. At one spot, however, I was able to see that the boulders are embedded in a red clay. In this stream are a few hard specimens of water-worn limestone; but as the remains of a limekiln are to be found high up the ravine where Chudleigh limestone used formerly to be burnt with wood, I cannot say that the limestones may not have found their way hither in a waggon. All through the ravine, and

in the roads and fields near, are to be found porphyritic blocks.

The main stream flows through flat grass lands, and exhibits nothing worth mentioning till the ford at Ashcombe school-house is reached. Here the valley narrows considerably, and the wilder part of the stream (so to speak) commences. A few years ago the stream was blocked up by huge boulders of trap; but I am sorry to say that most of these monuments of the past have been removed or broken up, to admit of the building of a small weir. There are still remaining about two dozen blocks, the largest of which measures 14 feet in girth, and $2\frac{1}{2}$ feet in height, and possesses the peculiarity that I have frequently observed in other specimens of having one flat side.

Higher up, between the school and Midtown, are numerous boulders; and near Midtown, projecting from the bank, entirely covered and concealed by a coating of moss, I discovered a block of limestone, the part of which was above ground measured five feet by three.

At Midtown, where the stream receives the waters of its tributaries from Haldon Tower Plantation and Charnwood, the boulders are very numerous in the stream and the adjoining roads and fields. Indeed, they are not the exception, but the rule. Walls, cottages, and bridges are built of them; they are hollowed out for cattle-troughs, and the village appears as if built in a granitic country. Wherever there is a road, section, or a little landslip, they are found abundantly; they are by no means confined to the streams, but exist in all parts of the valley. No doubt formerly they were to be found in much greater numbers; even in the last 20 years many have been removed, but they are still in sufficient numbers to arrest the attention of the most ordinary observer.

From this point upwards all the streams contain limestone blocks.

By the river side, about half a mile above Midtown, I observed, on a small scale, what I afterwards found on a much larger one, that the following is the order of stratification in this valley. Deepest down the ordinary new red sandstone conglomerate of a fine grain. Resting on this lay a bed or stratum of coarse conglomerate or breccia, containing limestone and trap pebbles, and cemented together, probably, by lime—a regular breccia, in fact, formed of the materials of the deposit above the new red sandstone. Above this lay a stratum of red earth, containing large blocks of limestone, trap, and flints, from the Haldon gravel, lying higgledy piggledy, per-

factly unstratified, the blocks not even arranged according to gravity.

To avoid repetition, I may as well say at once, that where I found a section the same order of things appeared—always the red sandstone at bottom, always a breccia of trap and limestone resting upon it, always red mud above this containing boulders. I never found the boulders resting upon the red rock, although they may do so. The breccia higher up the valley is very coarse, sometimes containing stones as large as one's head, sometimes larger. In one place I found the breccia surmounted by about 10 feet of fine red sand, evidently a re-deposit; and further on I observed this passing into a red mud or earth, out of which emerged a huge trap boulder. It was not in the red rock, nor even on the red rock, but eight feet above it, lying in a superficial deposit.

The mud or clay in which the boulders are imbedded proved, on examination, to consist mainly of the *débris*, or the result of decomposition of trap stones. Many of these soften under the influence of water, and can be spread like mud or clay. The red earth evidently did not derive its origin from the sandy rock beneath, but was the result of the disintegration and decomposition of the igneous rocks.

I remarked that the red earth in some good sections contained no other stone but trap boulders alone, with the limestone boulders at its base between it and the new red sandstone, and in these cases not unfrequently the red earth was capped with Haldon flint gravel. In the lowest part, however, of the deposit, even when the three deposits were distinct, I detected numerous pieces of Haldon green sand.

I did not observe any fragments of limestone in the underlying new red sandstone, except in one instance, when a piece of limestone, about 18 inches in length, was firmly imbedded in the surface of the red rock, underneath the breccia.

I followed up this, and afterwards the Charnwood branch, to their sources in the green sand, and have nothing more to say of them than that they contained many blocks of trap and limestone.

Returning to the valley by the road which leads from Haldon to Midtown, I observed a solitary boulder of no great size projecting from the red earth of the road-side cutting. It had the peculiarity previously referred to, of having one flat side; but in this case in addition, the flat base was as smooth as a table, and as nearly polished as the nature of the stone would admit.

The stream which rises from Thorn's Plantation, and falls into the main stream at Court Farm, is crowded with trap and limestone boulders—from its source to its mouth. One trap boulder measured 10 feet by 5. A weathered block of limestone, from the number of fossils it contained, of what precise kind I could not determine, with encrinite stems, and numerous spiral shells, reminded me of the blocks found at Babbacombe, and another closely resembled the limestone of the Bradley valley.

From the bridge near the church to the river's source at Grammercombe, the exploration of the river is most difficult, it being so full of brambles and covered in by trees; indeed, there is no way of seeing it except by walking in the water. Frequently I was reduced to crawling on my hands to enable me to make any progress at all. At one point I almost gave up further travel in despair, when I was encouraged by finding a block of porphyritic trap lying across the stream of unusual magnitude. Part was buried in the bank; the part visible measured 13 feet by 8. Many parts of the stream showed good bank sections, and all parts, to within half-a-mile of its source, were filled with limestone boulders from two to five feet in diameter, mingled with rounded masses of trap. The appearance of the river's bed was that of a stream flowing through a limestone country.

Throughout my paper I have mentioned the boulders as found in the streams; this is simply because they are there most easily seen. They are, in fact, scattered all over the whole valley, so much so that if the earth could be removed, and all the boulders brought to light, the valley would appear as great a wilderness of stones as Lustleigh Cleave.

Boulders are found in the valley to the west of Little Haldon, but I have never seen one on any part of the summit of either Great or Little Haldon. There is one, however, which has been pointed out to me by Mr. Hutchinson, of Sidmouth, lying on the green sand at Holcombe Down. This, however, being only about $2\frac{1}{2}$ feet long by 18 inches wide, and about the same height, may, as he suggest, have been brought hither by human hands. I have not seen any in the Exe valley, or even on the other side of the low ridge of hills to the east of the vale of Dawlish. There are numerous trap stones of a small size, and a large quantity of ash lying superficially, as we approach Haldon Belvidere, and the Dunchideoch end of the Kenn Vale; but the close proximity of the Haldon, Dunchideoch, Idestone, and Pocombe igneous rocks will easily account for this. Although I have been

continually riding in every part of the right bank of the Exe from Dawlish to Dunchideoch, I have never in one instance detected a block of limestone.

What conclusions may be drawn from these observations? We have a valley six miles in length by about two in width, the bottom and sides of which are filled with unstratified red earth or mud, resting on a breccia formed of stones immediately above, and in this red earth many thousands of erratic boulders of trap and limestone weighing from one to six tons. We find some trap boulders with smooth sides, and frequently both trap and limestone blocks mingled in confusion with Haldon flints.

Two questions arise from this:—

1st. Whence did these erratics come?

2nd. How did they come?

1st. Whence did they come?

The nearest point at which limestone is now found *in situ* is near Ideford, about three and a half miles as the crow flies to the west. There are also the Chudleigh and Lyndridge rocks, about four miles to the west, with Haldon Hill intervening. The nearest known point at which igneous rocks at all resembling the trap boulders is found is at Idestone and Knowle, about six miles to the north, and Pocombe and Dunchideoch. De la Beche instances the rocks of the two former places as nearest resembling the trap boulders, as they contain crystals of quartz and felspar;* but whatever actual spot they came from, they must, I presume, have come from the junction of the new red sandstone and carboniferous rocks, which takes place at the N. and W. Probably, therefore, both limestone and trap boulders were brought from the N. and W.

2nd. How did they come?

Not scattered by the shot of a volcano, for volcanoes do not distribute limestones. By water? Without insisting upon the difficulty and the enormous time required to shift from two to six ton blocks so many miles, I think that had water been the agent there would have been more appearance of stratification, the blocks would have arranged themselves somewhat according to their gravity, and the bed in which they are found would be shingly or sandy, and not red mud or

* Mr. Vicary, of Exeter, has shown in a previous number of the Devon Association Transactions that these porphyritic blocks are in truth granite. If this be the case, their original home was Dartmoor, and their journey hither far longer.

clay, formed of the breaking up and decomposition of the transported blocks themselves.

They might have been brought hither and scattered broadcast by ice, and this, I suggest, is probably the solution of the difficulty. I submit that, when we consider the great weight of the erratics, the distance from which they must have been transported, the irregular way in which they are distributed, the unstratified, confused way in which they are deposited, the red mud in which they lie, and the finding them occasionally with flat polished sides, and the breccia between them and the subjacent rock, we are justified in raising the question whether their long travel was not due to glacial action.

BRONZE CELT FOUND NEAR SIDMOUTH.

BY P. O. HUTCHINSON.

(Read at Exeter, July, 1872.)

ON the 10th of April this year, 1872, Mr. Heineken, of Sidmouth, and myself again visited the Cross Dyke. This great work, 2,000 feet long, which crosses the Lyme and Exeter road at right angles, at the site of the Three Horse-shoes Inn, so much resembles the Cross Dykes of British or Saxon construction, as laid down on Long Bredy Down, Askerswell Down, Knowle Hill, and other places in Mr. Charles Warne's Map of Ancient Dorsetshire, as to leave no doubt on the mind that this is a work of precisely similar nature. When I alluded to it at the Honiton meeting in 1868 [*Trans.* ii. 381], I called it simply "The Earthworks," not knowing what it was; but repeated examinations since that time have gone to prove that it was nothing else than a great Cross Dyke; and further, that it had been drawn over the ridge of the hill by the occupiers of Blackbury Castle, opposite which it is placed, to arrest the progress of some enemy advancing from the valley of the Axe. The finding of many sling-stones on both sides of it, exactly resembling those discovered in the cave at Sidbury Castle, have not been without their significance. Before leaving the place in April, Mr. Heineken charged the people at the inn, that if they should turn up any coins or old pieces of metal of any kind, to be sure to take care of them. On hearing afterwards that something had been found, we proceeded again to the spot on the 14th of last June. Mr. Carter, the landlord of the inn, and tenant of the adjoining land, told us that he was last year working in the lane that runs northward from the road, at about 150 yards west of the inn, or about a quarter of a mile west of the tenth mile-stone from Lyme. This lane points towards Blackbury Castle, and is likely to have been the line of communication between the camp and the Cross Dyke. He was digging earth from the ditch close to the

eastern hedge, and throwing the earth on the top of the hedge with his shovel. Along with a spadeful of earth he threw up the celt, but did not perceive it at the time. Some showers of rain subsequently washed it clean. Remembering the charge about old metal given a couple of months before, one of the workmen said that, in passing that way, he had seen something like a piece of old brass lying on the hedge at the spot indicated. Upon this Mr. Carter proceeded thither, and found the celt in the earth he had thrown up. This celt is of simple make, of rude workmanship, and of early type. It is merely a flat piece of bronze, with a slight edging, five-sixteenths of an inch thick, without socket, ears, or flanges. It measures four and a half inches long, and two and three-eighths broad at the widest end ; and it weighs seven ounces and a quarter. On both sides there are a number of longitudinal cuts, as if it had been chopped by the sharp edge of another celt. This species of ornamentation is found on similar objects met with in Derbyshire and in Ireland.* The alloy of which it is composed appears to be abundant in copper, the tin being rather deficient in quantity. A short time ago I was looking at a celt of somewhat similar pattern in the Taunton Museum, and I was informed that it appeared to be composed almost entirely of copper. Now, if future research should lead to the conclusion that implements of this type are uniformly deficient in tin, I think that two inferences would necessarily be forced upon us ; namely—1st, That such celts were the first, or earliest made of metal ; and 2nd, That there was a Copper Age, which preceded the Bronze Age. As yet it is too early to pronounce with any degree of certainty, but there is no harm in bearing the point in mind. This celt is the property of Mr. Heineken, who intends to present it to the Exeter Museum, as one more fact obtained in the ancient history of South-east Devon.

* See "Student and Int. Obs.," v. 275, for an article on Celts by Llewellyn Jewitt.

EXMOUTH WARREN, AND ITS THREATENED DESTRUCTION.

BY J. M. MARTIN, O.E., F.M.S.

(Read at Exeter, July, 1872.)

THE encroachment of the sea on the Exmouth Warren was the title of a paper read by Captain Peacock, F.R.G.S., originally, before the Exeter Naturalist's Club at Starcross in the summer of 1869, and subsequently, at the meeting of the British Association held in this city in the same year.

At the first meeting of the club in 1871, Captain Peacock called the attention of the members to the changes which had taken place since the reading of his paper; which changes, though continuous, were comparatively unnoticed, as there had in the intervals been no such gales as that which in January, 1869, swept away so much of the Warren.

Between these two periods there was considerable discussion through the medium of newspapers; there were leaders written by their respective editors calling attention to the serious consequences to the commerce of Exeter that might ensue upon an extension of the present or the formation of a new breach in the spit of land which lies at the mouth of the river Exe; the subject was more than once broached in the Town Council, and a formal resolution even was moved on one occasion to the effect that "it was desirable the Council should take means of ascertaining the probable effect the washing away of the Warren would have upon the navigation of the River."

But since then next to nothing has been heard of the matter, which would probably not have been the case if heavy weather had prevailed; and I should not now have brought the subject before this Association, were it not for the purpose of taking advantage of this meeting to again call public attention thereto in the presence of representatives of Science on the one hand, and, on the other, of that commerce which is presumed to be threatened with extinction or thereabouts, if the encroachments of late years so great should continue.

The Warren, as is well known, consists of two parts, an inner and an outer, having at high tides a considerable sheet of water between them. The inner portion consists chiefly of a low ridge of sand, and a considerable expanse of mud-flat or ooze. No change, so far as I have been able to ascertain, has occurred in this portion that can for one moment be compared either in extent or importance with those which are known to have been going on for the past century on the outer Warren, or that portion next the English Channel; which comprises, or rather did comprise a century ago, a continuous ridge of sand-hills of varying height and of considerable width, flanked at the eastern extremity by a sandy bluff of about fifty acres in extent, and twenty to twenty-five feet in height. Inside the Warren, and protected thereby, is a pool with deep anchorage, called Exe Bight, where ships of considerable burthen may lie safely, and it is to this anchorage that injury would in the first place arise in the event of a breach in the inner Warren, which is composed of sand, in places only a few yards in width, and which is itself protected by the outer Warren.

I have prepared a diagram of the seaward portion of the Warren, on which are delineated the outlines thereof at four different periods, ranging over the past eighty-five years. It shows that a considerable area has been washed away from the whole sea-face, that gaps have from time to time been made in the once continuous frontage, and that the detached bluff has totally disappeared. To convey an idea somewhat commensurate with the extent of this encroachment of the sea, I will merely state that at the time the oldest of these maps, bearing date 1787, was constructed, the high water channel between the bluff and the land on the Exmouth side was about 430 yards wide. Twenty-two years later, in 1809, the bluff had been so far lessened on the side of the channel that the distance across was ninety yards greater. Thirty years later still, in 1839, this once extensive bluff was represented by three little sandy islets, and has now entirely disappeared; the width of the channel having increased in eighty-five years to 970 yards, or more than double its width eighty-five years since.

Besides the detached bluff some 25 acres of the eastern end of the ridge, which has a tendency to turn northwards from its original line of direction and travel up the river, have also disappeared.

About 600 yards west of the present extremity of this ridge is a gap through which the tide flows at spring tides to

a considerable depth, filling the space between the inner and outer Warren previously referred to. A sheet of water existed here as long ago as the date of the oldest trustworthy map I have been able to discover, viz., in 1787, but it had then no direct communication with the English Channel, being filled through a channel leading from a point between Exe Bight and Exmouth Passage, so that the water required to fill it had first to pass through the navigable portion of the river between Exmouth and the Warren.

The channel above referred to is now closed by the dam of the Exe Bight Pier and Oyster Company.

This gap, or breach, in the outer Warren was made in 1859, at a point just eastward of the site of a previous breach made in 1824, which breach was promptly closed by the then authorities, whose works still remain to testify their efficacy.

The 1859 breach was at first comparatively small, but doubtlessly growing larger. Suddenly, in the storm of January, 1869, it was enlarged to five times its previous width. It became a formidable breach 130 yards wide, and the bottom thereof was degraded to near low-water mark. Since January, 1869, we have had no such storms as that, yet the breach has gone on widening, until at this moment it is 240 yards wide, having nearly doubled in width in three and a half years of comparatively smooth weather.

Altogether, I estimate that of the seaward face of the Warren, a portion equal to more than 100 acres has been removed by oceanic and fluviatile degradation. This process is still going on, and is seriously weakening the barrier between the English Channel and the Harbour of the Exe.

Probably many years will elapse, if this action is not intensified by storms, before it will ultimately be broken down; but its constitution is destroyed; it is, so to speak, on its last legs; and if it receives many such shocks as that of 1869, or if the inner Warren should be broken through, the most serious consequences to the Port of Exeter may be expected; the navigation will be stopped, the occupation of the canal will be gone, and the Exe Bight anchorage will become what Captain Peacock so graphically described as a "dangerous bay of shoals."

The vast mass of material that has been thus removed must surely have been deposited somewhere; and it would be interesting to ascertain, with some approach to accuracy, what changes have taken place in the bottom of the estuary during the period under observation; but I fear that, beyond bare outline, no trustworthy account exists of the progress of

changes that after a lapse of time may be found to have been quietly going on, and producing serious results.

The question naturally arises out of the foregoing remarks —If the consequences of this degrading action of the sea are likely to be so serious, what course can be adopted to repair existing damages and prevent their further extension ?

Another question must be first answered, viz.: What is the history of the Warren? what formed it? and what is now destroying it? The answer to this appears to be, that the prevalent winds and waves along the coast have forced northward and eastward the *débris* of the cliffs which bound the south-eastern part of this county, which must in the lapse of ages have been, from the friable nature of the rocks, enormous in quantity; that this *débris* has formed in the shelter of the rocks at the mouth of the river a gradually protruding tongue of land, in a direction continuous with the line of coast, checking the turbid water of the estuary, which deposits its sediment on the river side thereof.

This action is likely to go on until only such a channel is left as the effluent water from the estuary at ebb tide is able to keep open, when, under ordinary circumstances, so long as the conditions under which the spit is formed remain unchanged, the spit itself remains stationary, subject only to such minor changes as are caused by abnormal agencies; the action of these being afterwards modified by the general action of the continuous agencies.

Supposing that now, from some cause, the supply of the materials forming the spit ceases, the same action of the elements which tended originally to form it being directed upon the spit itself would naturally wash it away, and the materials of which it is composed would be gradually drifted towards its extremity, and either carried by the flood-tide into the estuary, or by the ebb into the sea; either to form shoals, or to be carried under the stream, and along the coast on the opposite side of the river. This action is to be observed in this case, the heaviest materials of which the Warren is composed being exactly analogous to those on the coast from Teignmouth upwards, with this addition, that amongst the larger gravel and pebbles found on the north-east side of the Warren, opposite the Exmouth Docks, occur large fragments of limestone, with the edges of their fractures only slightly rounded, and, with that exception, looking just like the pieces of stone which are to be seen wherever masons have been at work. As these fragments, if found at all, are certainly not so numerous along the line of coast west of the

Warren, it seems to me extremely probable they are the chips of the blocks of limestone used in forming Brunel's railway wall along the coast. If this assumption be correct, it would seem that the foregoing scheme of the formation of the Warren is at least probable; and this being so, we can find, at any rate, one cause of the cessation of the supply of material to the Warren in Mr. Brunel's sea-wall itself; for since its construction only a very small fraction of the immense amount of rock previously falling into the sea, to be ground up into gravel and sand, could possibly find its way there. I do not presume to say that this is THE cause why the Warren has decreased in size, for it is evident the Warren was lessening before the railway was constructed, but I do believe it is aiding in its destruction.

To attempt to permanently fill the gap by artificial means would tax the resources of a more wealthy and enterprising community than ours, and require a larger inducement than we possess; but some action could be taken to prevent further injury, and the same action would have the effect of strengthening, and to some extent restoring to its original form, this barrier against the incursion of the sea.

If it be granted that this theory of the formation of the Warren be correct, it would follow that any means that would arrest the comparatively small flow of shingle and sand now drifting along the coast, would have a tendency to reduce to a minimum the waste going on, and if the means were adequate, and the supply of materials sufficient, to check it entirely, and build up a new rampart instead of the old.

As Devonshire men, most if not all of us have seen the effect the groins constructed for the protection of the South Devon line of railway have had in retarding the drift of gravel towards the mouth of the Exe (I do not attach so much importance to sand, because that is much affected by wind; and if once the gravel beach can be established, sand will by the same action of the wind form dunes beyond it), how that the gravel has risen to the tops of the groins on the windward or south-west side, and even swept over them; whilst on the north-east or lee side the beach is no higher at the head of the groin than at the toe or point thereof, the differences in level amounting sometimes to as much as twelve or fifteen feet, and the increased height on the windward side extending to the extremity of the groin itself.

The same effects can be seen at any harbour or projection on the coast from Exmouth to Hurst Castle, and it is owing to this uniformity that I am inclined to attach a faith to the

use of groins that I at present deny to any other mode of dealing with the difficulty.

There are other points, such as, for instance, the preservation and improvement of the Exmouth Channel, that will demand, as well as those already adduced, the most careful attention, should the matter ever have to be practically considered; but I know that the time at my disposal, and I think, perhaps, the scope of the Association, forbids going further into detail, besides which I feel that I have already occupied the attention of the meeting sufficiently long; but if an excuse or an apology be needed for obtruding this twice-told tale on your notice, the first must be that I know great interest therein is felt by a large number of gentlemen present, and the second that until I had actually surveyed the Warren, and the gap therein, I had no conception of the vast extent of the waste that had been going on, and having become possessed of this knowledge, I deemed it proper to direct the attention of the Association thereto.

ANCIENT EXETER AND ITS TRADE.

BY SIR JOHN BOWRING, LL.D., F.R.S., ETC.

(Read at Exeter, July, 1872.)

LONG before the introduction of manufactures into the district, the castellated city of Isca was built, and strongly built, for military purposes. It has stood—sometimes successfully, but not always so—many a siege. According to a Latin inscription, somewhat rudely rendered—

Exeter five gates hath of chief note and name,
Besides six others of less mark and famo.—*De Vilarin.*
Quinque habet insignes Civitas Exoniæ portas
Præter sex alias famæque notæque minoris.

But of these eleven portals not a single one now exists, and of the walls only a few vestiges remain. It is much to be regretted that a description of the city, written in the 13th century by a native, Joseph of Exeter, the most distinguished poet of the middle ages, is not to be found; but from Henry I. to Charles I. a succession of royal charters shows the high rank it held among the cities of the empire.

In retracing a portion of its history, two divisions, the ecclesiastical and the commercial, are most marked and prominent. Of its church annals I do not mean to speak—they have been diligently recorded by Dr. Oliver—nor to revert to topics of no small local interest, such as the existence of a mint—the locality where it stood is still called Mint Lane—whose issues are to be traced from the Anglo-Saxon times down to those of the Stuarts; nor shall I refer to the trades which have followed the disappearance of the great staple of Exeter, the woollen manufactures.* But the history of that

* Captain Shortt refers in his random way to several local tokens, but I am not aware that any book has been specially devoted to this subject. Boyne's "Tokens of the Seventeenth Century" (Devon and Exeter Institution), classifies them in counties, and describes 231 Devonshire specimens, many having distinct allusion to the woollen trade. The Bowring token is not amongst them, but two others are mentioned as issued at Chulmleigh.—R. D.

I am not aware that any collection has been made, or any history written of the local tokens, which, from the want of small currency, were issued for

trade memorably marks the annals of the old city. In the year 1068 the number of foreigners settled in the city was so great that they were compelled by the inhabitants to take a part in its defence against the Norman invaders. From the time of Edward the Third much encouragement was given to the manufacture of woollens. In the year 1458 the *cordwainers* (for the shoemakers then retained their Norman name, which was deemed more aristocratic than the Saxon designation) had a fierce quarrel with the *tuckers*, as to the precedence to be accorded in the mayor's processions. It was decided they were of equal dignity, and were to walk abreast, one of each trade in the show. In the year 1490, 5 Henry VII., the weavers and fullers were incorporated. They have for armorial bearing—On a shield chief *Ermine*, two burling irons, *or*; between them, a Sleigh erect, *or*; beneath *parti per Saltire*, *gules* and *azure*, on the *azure* two shuttles, *or*; on the *gules* above a teazle dubber *argent*, and a pair of shears below, *argent*. Motto : *Labor, labori, laborem addit*, which is less emphatically represented by the translation—Labour adds labour to labour. There was a town as well as a trades' rivalry. Crediton, of which its inhabitants proudly, but not truthfully, boast, that

Kirton was a market town,
When Exeter was a vuzzy down,

denied the right of the Exonians to establish—as was done in 1538—a weekly market for wool, yarn, and woollen stuffs; they fought for their monopoly down to 1540,* when the Lords of the Privy Council being appealed to, and the traders in Exeter declaring that their sales amounted to £10,000 per week, *i.e.*, yearly to more than half-a-million, the Kirtonians

the convenience of trade in the reign of the second Charles, and of which I have a specimen before me, in brass, issued by an ancestor of mine, John Bowring, of Chulmleigh, in 1670, with the device of a wool-comb: of these tokens, when a certain number were collected, the value was paid in the silver or gold coin of the realm. An issue of a similar character took place in Exeter and elsewhere about eighty years ago, for the convenience of those who could not procure a supply of copper coinage of the reign of George III. One of them bears the effigy of Bishop Blaize, the patron saint of the weavers.

* Davidson's "Bibliotheca Devoniensis" mentions the following:—"An Act to enable the inhabitants of the Hundreds of Lifton, Tavestocke, and Rowburgh, to mix flocks in their woollen cloths," &c. 7 Edward IV. c. 2.

"An Acte concerning true makynge of clothes in Devon, called White Straytes." 6 Henry VIII. c. 2. 1514.

"By the Queene. A Proclamation for the reformation of sundry abuses about making of clothes, called Devonshire Kersies or Dozens, whereby the Statutes made in Queene Marie's time, for the weight, length, and breadth thereof, may be duly obserued hereafter. . . . Given at our Palace of Westminster, the xx day of Januarie, in the xxxiv yere of our reigne. 1591. God sauе the Queene."—Folio, single sheet. British Museum. R. D.

were beaten by the Exonians, and the weekly market held in Northgate-street was transferred to Southgate-street, where, even in my memory, merchants, manufacturers, and foreign captains, met to arrange the business of the day.

In successive years, from 1584 to 1589, Sir Walter Raleigh obtained from Queen Elizabeth licenses to export woollen broadcloths, on payment of a duty to the sovereign. One license was for 8000 pieces. Another allowed him to violate the usages of the time, and to send away "over-lengths." These grants were objected to by the court officials, as inordinately profitable, and they recommend that the "Queen's duty" should be increased. In the year 1587 Sir Walter wrote to the Lord Treasurer Burghley :—"The citizens of Exeter as yet refuse to bear such part as was thought meet by the Levetenants of Devon and the rest." This was in reference to a levy of 2000 foot and horse, and the ground of exemption was that the merchants had suffered so much from the expenses incurred in defending their trade against the Barbary pirates. The illustrious Devonian knight who was sold and brutally sacrificed to the King of Spain by our crowned donkey, James I., traded largely, and profited mightily by monopolies; and if it be true, that without reference to the diamonds, rubies, and other precious stones which adorned his hat, his garments, his armour, and his weapons, "his shoes alone were worth more than 6,600 gold pieces," we may well understand how needful it was that his purse should be replenished, in order that his vain-glorious sovereign lady, who delighted in parade, might look complacently on that Sir Walter to whom her smiles were "brighter than the meridian sun." In 1662 the Exeter merchants complained of the monopolies Exeter possessed by the merchant adventurers, stating that their trade had suffered; that the merchant adventurers did not ship from Exon the tenth part of what was shipped by others; that individual merchants in Exeter, Mr. Ruthe especially, carried on a far larger trade than this company. The company replied, naturally enough, that they did not buy Exeter goods because they could not sell them. Leave was given to everybody to buy, but the privilege being valueless, as they said, was revoked in 1663. In this year France is reported to have sent us £2,600,000 of commodities, against £1,000,000 sent by us to them, principally woollens, a clear loss, says Mr. Saml. Fortny, of at least £1,600,000. In 1665 there was a great emigration of 2000 men connected with the woollen manufacture to the Palatinate.

The English from time immemorial seem to have considered

the possession of long wool, and the woollen manufacture a sort of monopoly on which their universal prosperity was built. We seat our Lord Chancellor and our Judges on woollen seats that they may constantly bear in mind their duty to protect this staple of the land. "Wool," says a writer of the seventeenth century, "is the flower and strength, the revenue of England;" and Fuller's earth, deemed necessary to the manufacture, conferred on England as a peculiar gift of God, is scarcely less patronized by our ancient legislators.

Vehement protests had been addressed to the government of William and Mary against the exportation of wool, and a great machinery was provided for securing such wool. In 19 counties there were 17 surveyors, 299 aiding officers; they seized 457 packs of wool, appraised at £3791, of which 162 were condemned, and sold for £744. 509 packs were rescued from the officers of the value of £2705. The annual cost of the commission was £20,878; the net cost, £20,138; and of the £744 so realised two-thirds went in law expenses. A scheme for guarding the coasts to prevent the exportation of wool is estimated at £27,949 14s. 11d. The commissioners applied unsuccessfully for a grant of £30,000 a year. In Devonshire, with 13 officers, five packs were condemned, which realised £36, and the cost was £720!

The terminology of the trade has now for the most part disappeared from our vocabulary. Proper names immediately connected with the ancient fabrics are still common, not only among the labouring classes, but also among the gentry, such as Tucker, Fuller, Dyer, Soper, Weaver, Dresser, Spinner, Calender, Shearer, and the more agricultural, like Shepherd, Farmer, Franklin, Barton, Ostler, Butcher (more anciently Flesher), and such like. These remain, and no doubt, with more complete records, would lead up descendants to the occupations or trades of their ancestors, as on a wider scale the Smiths and their sons, like the Taylors, Carpenters, Hilliers, and Tylors, would land us among our Norman or Gothic forefathers. Who hears now the word *Sose* or *Socii*, with which in my recollection the master or the foreman was wont to call his companions together? To whom are the words Estamene, Segathee, Say, Sanford, Long Ells, Semipitern, Imperial, Templar, Duroy, Worley, Franciscans, now familiar? names the household words of generations which have ceased to be. Who shall now explain what was meant when a Tucker was accused of having *slotted* his work? when he was blamed for its being *scovy*, and lauded for its being *suent*?*

* The following local words, which I find in Mr. Shelley's "Glossary of

It is within the memory of some of the existing generation that a large proportion of the working classes in Exeter wore a bright green apron of serge, fastened with a girdle of the richest scarlet. These were the Tuckers of the privileged guild of Fullers, Weavers, and Shearmen, whose hall still exists on the slope of Fore-street hill, and whose freemen are reduced to a few score of ancient people, who are still the recipients of the bounties, and many of them the occupants of the alms-houses built or endowed by those who had prospered in the woollen trade. At the present moment, of the directors of the Bank of England, three at least had for their forefathers gentlemen who were Exeter woollen merchants; and in the small parish of St. Leonard's, on the skirts of Exeter, which had only a few hundred inhabitants, no less than five peerages, and several baronetcies and knight-hoods, are traceable to the good fortunes of those from whom they descend. Among these the Ashburtons (Dunning and Baring), the Northbrooks, Tauntons, Giffords, Duntzes, and Kennaways, may be mentioned; and it is believed that Russell, the founder of the fortunes of the Bedford family, was a prosperous woolstapler in the South of Devon, when Exeter was the central dépôt of the western woollen trade. I am not aware that any exact statistics exist, showing the extent of the exports of woollens during the prosperous days of the manufactures; but it is recorded that from the port of Exeter the annual value of the productions—mostly for foreign markets—amounted to half-a-million sterling.* Certain it is that vessels were loaded at the Exeter quay for the ports of Spain, Portugal, Italy, Germany, Holland, and the principal commercial states of Europe; and that even to the

of the Devon Dialect," I have heard employed by workmen in my father's service:—"Abb, coarse yarn; *Alabash*, boiling; *Basem*, black and blue; *Bittie*, wooden mallet; *Cachanded*, awkward; *Chinchawy*, long lingering; *Clome*, earthenware; *Catchypaw*, left-handed; *Davored*, fading, decaying, bad dyeing; + *Leat*, the diversion of a stream, principally for fulling mills; *Louster*, a laborious man; *Mazed*, mad, confused, wandering; *Maund*, a basket; *Muckett*, leatheren apron; *Pots*, leavings, fragments; *Pearn*, lively, active; *Quarrel*, pane of glass; *Remlet*, end of piece of cloth; *Shard*, broken ware; *Wisht*, dismal, desponding, unapt, good for little; *Yoke*, undressed wool.

* Brice mentions that as much as from £50,000 to £60,000 worth of woollen goods had been sold in a week in Exeter. He is quoted by Lysons, who has much to say on this trade.

Was not Topsham also a great shipping outlet for the woollen fabrics?—R. D.

Yes; especially for vessels of larger burthen than could conveniently come to Exeter quay.—J. B.

+ He omits *Dub*, to draw down with teazles the wool of the cloth.

present hour the Long Ells of Devon have preserved in China a reputation superior to those of any rival districts. A century ago there was scarcely a cottage in central Devon in which there was not a loom employed for the weaving of woollen stuffs. The Exeter merchants were travelled men, speaking German, Dutch, Italian, Spanish, Portuguese, and French, with great fluency. In the serge market, as it was then called, I have heard conversations carried on between them and the foreigners; and I had personally the privilege, when quite a boy, of receiving very valuable lingual instruction from those who were most competent to communicate it.

Of the various public charities which grace the records of the city, many may be traced back to the munificence of the merchants and manufacturers engaged in the staple trade of the district. The Report of the Commissioners on the Charities of Exeter, printed in 1825, gives the details of the several trusts. There are more than 100 alms-houses, most of which are endowed; and the annual produce of the different charities is from £3000 to £4000. Of the endowed schools this is not the place to speak. The instruction given is by no means satisfactory, nor suited to the wants of the age. Considering their large resources, they have produced few men distinguished in any of the walks of science, art, or literature. That important changes will be the result of the late Act of Parliament is certain, and it is hoped that the capital of the west will bring into the public field men worthy of the progressive age in which we have the privilege to live. Happily, on the subject of endowments and charities of all sorts, which represented the religious, often superstitious, feelings of the age, much is to be done to accommodate them to an altered state of things. There are considerable grants to the poor people in the shape of alms-houses, schools for instruction, and premiums on apprenticeship to the woollen trade, and other objects now obsolete, which ought to receive another direction.

The Hospital funds, applicable to the housing and maintaining of lepers—leprosy being extinct in this country*—have, I believe, been applied to the relief of those suffering from diseases having some analogy to the old distemper, such as scrofula, scurvy, and the like. A school for gratuitous instruction was formerly attached to the Tuckers' Hall. It was

* Leprosy was so common here in the middle ages, and so badly provided for, that they were allowed to leave their house, and to beg for food in the Exeter markets and fairs. In 1163 Bishop Iscanus ordered a toll to be levied for their support on all corn and bread sold in the city.

there that Mr. Richard Durant, the owner of Sharpham, received his early education, his father being free of the guild; and I know that his benevolence made the last days comfortable of Philip Gove, the master of the school. Miss Durant, a favourite sculptress of the queen, is a niece of Richard.

There stands, little changed, though now converted into a picture shop in the Cathedral Yard, an ancient, gable-fronted, and balconied building, which looks as if it had been removed bodily from Amsterdam to Exon—promoted from the banks of the Y in Holland, to the borders of the X in England—which was formerly known as Moll's Coffee House. It was here that for many centuries, and down to the beginning of the present, “merchants most did congregate.” At the tables below, as they sipped their coffee, chocolate, or tea, they discussed the questions of freights and cargoes, woollens to be exported, and wines, or other foreign produce, to be brought home in return. The *habitat* remains; but not a single representative, and very few recollections of the busy men who talked many strange languages, had been great adventurers, and understood the mysteries of exchanges, the forefathers of some of the present most opulent and distinguished of London merchants and bankers. In the same Cathedral Yard lived Thomas Crispin,* one of those public benefactors, founders of schools and alms-houses, who did for Exeter what Gresham accomplished in London, and Colston in Bristol. The locality is admirably described by Trollope in his modern novel, *He knew he was right*, which shows how ecclesiastical influences have continued potent, while the mercantile interest, so important once, has been dissolved almost into nothingness. Crispin was born in Kingsbridge, where he endowed a school, still prosperous, and ornamented with his portrait. Of the charities left for the encouragement of the woollen trade, several will, ere long, have to be devoted to other purposes. They represent the conditions and the

* The inscription over the entrance of Crispin's School, at Kingsbridge, is, “This Grammar School was built and endowed (1670) by Thomas Crispin, of the City of Exeter, Fuller, who was born in this town the 6th of January, 1607.”—R. D.

In this school Dr. Wolcott, better known as Peter Pindar, received his early education. I propose on some future occasion to give some account of this witty and once very popular writer. His account of George the Third's visit to Exeter is very amusing, and the verse in which he records his Sovereign's fling from his horse—

“When all the courtiers believed their monarch dead,
But luckily he fell upon his head,”

is not forgotten.

requirements of by-gone times, and their appropriation must be accommodated to new-born wants.

The causes of the decline and decay of the woollen trade in Exeter were twofold—some personal, some material. In other words, it was the combination of circumstances traceable to the withdrawal of intellectual or physical resources which sufficiently account for the migration of a very important, an increasingly important, branch of manufactures to other localities.* There were causes of decay independent of these. Trade, commerce, manufactures, flourish best in the free field of competition. The trade of Exeter was crushed by privileges and monopolies. All the conditions of production were imposed by stringent laws. No one could enter except through the narrow door of apprenticeship, and the *freedom* of the few was necessarily associated with the *vassalage* of the many. The guilds determined *how* the work was to be done, wholly forgetting that though they could compel the producer to subject himself to certain conditions, they had no power whatever to give laws to the consumer. Even at home people seek the cheapest and the best commodity among native competitors ; while abroad; upon which demand the Devonshire manufactures principally depended, there was the rivalry of the whole competing world. Meanwhile new elements were brought into the field. Machinery tended more and more to displace the labour of the hand—that labour which guilds were created principally to protect—and machinery sought for its cheapest production the metallic and carboniferous districts, which Devonshire did not possess. It was in vain that infractions of the law were punished with the severest penalties, even with death. The exportation of

* One of the most extensive and experienced of our manufacturers has favoured me with his view of "the causes which led to the decay of the Devon woollen trade."

1. The existence of a restrictive policy amongst the producers themselves, which paralyzed all effort to create or discover new channels for their products.

2. The decline of demand, from other articles being substituted, or a similar article being manufactured nearer at hand to the consumer, as in the old trade with Holland, Spain, Portugal, and Italy.

3. The great bulk of production was Long Ells, or one class of serge, which, from the restrictions in the trade existing in China, was not capable of great expansion ; and this being so, when the other branches of the woollen trade fell off, notwithstanding the fact that no great expansion of the trade could happen, an excess of production of Long Ells occurred, which was followed by the inevitable reaction depressing this particular branch of the woollen trade for years.

4. At a later period the want of men in Devonshire of sufficient means and wide views to create new branches in the trade when the old had dropped off.

the raw material, the Long Wool of the West, was prohibited ; the length, the breadth, the mode of fulling, dyeing, pressing, packing, all was regulated according to what was believed the most perfect arrangements. It was all in vain. The fetters imposed by monopoly were feebler than the pinions of freedom, and the trade fled to the regions where it had least to fear interference and molestation.

But when there has been a disposition to bring trade and aptitude into the competitive field, it has been found that the disadvantages of Devon might be counteracted by some of its local privileges, as, for example, the greater adjacency of the raw material, and the benefit of a first examination and selection from the best hands—the sheep-owners—added to the lower rates of labour in agricultural as compared with manufacturing districts. The Devonshire manufacturer must more slowly avail himself of those economizing and accelerating processes which are constantly developing themselves in the centres of inquiring industry ; and there is a class of workmen—the educated and scientific foremen and superintendents—who are not readily supplied from any but those busy centres. The character of the whole mass of labourers is, no doubt, elevated and improved by the presence and supervision of these superior handicrafts ; but after taking into account the *pros* and the *cons* which constitute the conditions of the woollen manufacturer, the result is, that a large and, there is reason to believe, a not unremunerative woollen trade is now carried on at North Tawton and Chagford in Devonshire, and at Wellington, near the Devonshire borders.

The changes which have marked the progress of the woollen manufacture in Devonshire are mainly the following. The information is furnished to me by Mr. Fulford Vicary, one of those intelligent manufacturers who might have saved, had they existed half a century ago, the ancient trade of Devon from its present decline and decay.

"The improvement in the growth of wool in Devonshire has been in the production of a longer pile, and a more silky and lustrous appearance. This has, of course, not altered the texture, by which is meant the mode of weaving and spinning for any fabric, but has improved it in appearance, and enabled the manufacturers to use the coarser kinds of wool, of which the finer sorts only were applicable at an earlier period. Some old-fashioned people consider this a very questionable advantage, and such is my opinion also.

"Foreign wool is very slightly used in the Devonshire woollen trade, as it does not blend or mix well with the wool

grown in the district, and if the fabric is dyed afterwards, this is very apparent.

"The old plan of washing wool was, for Short Wools, to wash it in a stream in a basket. The water drained through the basket leaving the wool behind. The wool was then dried in a loft. Long Wool, for combing, was washed with two crooks twisted reverse ways, squeezing the water out like wringing a towel, and was a very slow process. Later, the wool was passed through two rollers, weighted, and the moisture squeezed out. Different varieties of these rollers existed, but the quantity of wool they could wash was limited, until a machine was brought out in the north, by which a continuous stream of wool passes through water, afterwards receiving great pressure, rendering the wool nearly dry. One of these machines will wash 5000 lbs. of raw wool twice over in one day.

"Hand-combing of wool was a very laborious process, and unhealthy, from its being done with the assistance of a charcoal fire, kept up to a considerable heat. The quantity a man could produce of combed wool in a week would be about 60lbs., which was paid for at the rate of about 2½d. per lb., or 12s. 6d. weekly; but to do this it would be necessary for him to work sixty hours in the week. A single combing machine will produce in the same time 3600 lbs., at one-half the cost in labour, soap, and oil, including the expense of repairs and the necessary power to work it. Ten years ago I had twenty men, producing 1200 lbs. weekly. I have still the twenty men, but with them I can now produce 20,000 lbs. of combed wool weekly—a very great step, although it has taken ten years to do it.

"The change from the old hand looms to power looms has been very gradual. Power looms for the Devonshire woollen trade are not well adapted, and are susceptible of great improvement. The old cottage loom at the present time weaves a better fabric than the power loom can accomplish; but this difficulty is being overcome, and must, in the nature of things, eventually succeed. The productions of the power loom, with the same amount of labour, is five times as much as can be produced by the hand loom; but, taking the wear of the fabric into consideration, the advantage certainly rests with the hand loom; that is, at present.

"There have been introduced into the Devonshire woollen trade a greater variety of woollens; but, so far, only by myself to any extent. The texture, or manner of weaving and spinning, remains in all cases very similar; but the adap-

tation is altered to suit different markets, and I am still on the look out for new channels for our production, in case of that very rainy day coming when the old branches fall off."

Of the withdrawal of some of the more distinguished representatives of the Exeter trade to wider areas of mercantile adventures a few examples may suffice, and they will be found instructive. In the days of the great prosperity, an intelligent gentleman came from Bremen to settle in Exeter. His name was Matthew Baring.* He married an English lady, who, as was the custom in those days, took a very active part in the superintendence of the women, who were employed as *Burlers* (the name and occupation have now been lost in the West), whose business it was, for the remuneration of from 6d. to 9d. a day, to remove the "blacks," the knots, and the other defects of the woollen cloths as they were received from the weavers, after the first process of the fulling mill had removed the dirt and the grease by the employment of "Fullers' earth," or the less costly appliance of human urine. Madame Baring (I have often heard my grandmother mention her with respect and reverence) took charge of the details of

* The following particulars of the Barings are gathered from Dr. Oliver's *Exonian Biographies* :—

"The Rev. Dr. *Francis* Baring, son of John and Ann Baring, was born in Bremen, 21st January, 1656. Appointed Lutheran Pastor of St. Anascharius' Church, Bremen, and died in that office 3rd November, 1697. By his wife Rebecca (Voight) he left two daughters and a posthumous son (*John*), born ten days after his father's death. *John* was slenderly provided for, but received a mercantile education, and at the age of twenty came to Exon to learn the Serge manufacture, under Edmund Cock, merchant. Was naturalized in 1723, with a proviso that he should hold no office under the crown, nor hold lands, &c. In 1729 he married Elizabeth, daughter of John Vowler, an opulent grocer, who had retired to Bellair, on the Topsham Road. Her fortune and talents assisted him in extending his mercantile transactions, and in a few years he acquired considerable property. Purchased Larkbeare House of the Lavingtons (1737), the Rectory of St. Leonards for £90, Spur Barn, and other estates. Died 1748. Buried at St. Leonards.

John Baring = Elizabeth Vowler.
Died 1748.

John	= Ann Parker.	Thomas Vowler Baring	= Elizabeth Parker,	Francis.
Born in Palace St. Exon, 1730;	. . .	Died on the morning after his marriage, 1758.	who afterwards married William Spicer, and died 1817.	<i>Ob infants.</i>
founder of Ba- ring Brothers; M.P. for Exeter; died 1816, <i>at</i> 85, at Mt. Radford.				

Francis = Harriet Herring. Created a Baronet; d. 1810.	Chas. Baring = Margaret Gould. Born 1741; died at Exmouth, 1829.	Elizabeth = John Dunning. Lord Ash- burton.
(Buried at Gulliford.—J. B.)		

R. D.

the business at home, while her husband managed the correspondence abroad. Such was Matthew Baring's appreciation of his wife, that he built for her a fishing pavilion on the banks of the Exe, close to the lime-kilns in St. Leonard's, which was removed only a few years ago, and from the windows of which the diligent lady was accustomed to sport for the "finny tribes," when, the Exe waters being less polluted than now, the sport was more productive. Their sons were John and Francis, who were the founders of the great establishment of Baring Brothers in London, to which capital they migrated; but not until the elder brother, John, had managed, by the influence of a bank which he established by his connection with the Tuckers (all freemen of Exeter; for no others could exercise the craft), to be returned, in 1776, as M.P. for the city. The ambition of the house corresponded with its position. I have among my papers copy of a tender, from John and Francis Baring, for £300, to a loan, in the time of George III.—a strange contrast to the operations of their descendants, who, after the battle of Waterloo, contracted for £30,000,000! Other emigrants to the metropolis were the family of Gibbs, who occupy now so distinguished a place among our Metropolitan merchants; and the name, with many others, may be added of the Heaths, the head of whose London firm is now the Consul-General of the Italian Kingdom.

A distinguished name in the family of Gibbs is that of Sir Vicary, whom George III. was accustomed to praise in the highest terms, insisting that he personally had discovered his merits, and that to him alone the promotion of the lawyer was due. In consequence of his supposed and professed democratic affections, he was selected by John Horne Tooke as his advocate. A characteristic letter from Lord Eldon is preserved. "I say, from my heart, that you did yourself great credit as an excellent citizen, not sacrificing any valuable public principle. I say, from my judgment, that no lawyer ever did himself more credit, or his client more service, so help me, God!" A verdict emphatically judicial!*

Among those who abandoned Exeter in the decline of the woollen trade was James Manning, who embraced the legal profession, and died lately as the Queen's Ancient Serjeant. His father, of the same name, was minister of George's

* Dr. Hugh Downman, a local celebrity, published two sonnets on "the wreaths of honour," "the smiling virtue," "the filial piety," "the harmonious trophies," "the thoughts humane," which distinguished the learned knight, and "the pure steps" with which "he led his softer partner to his bed."

Meeting, whose mother married Mr. Samuel Merivale, the father of John Herman. James Manning was the partner of James Cox, some of whose hymns have been published. The colleague of Mr. Manning was Timothy Kenrick, known by his exposition of the New Testament, and who was succeeded by Dr. Lant Carpenter. The eldest son of Timothy Kenrick is John (now inhabiting York), who has won a deserved reputation in the classical, archaeological, and theological field. His mother was a Weymouth, whose family were woollen merchants. Perhaps still better known are the descendants of Lant Carpenter, whose eldest son, William Benjamin, the Registrar of the London University, and one of the Council of the Royal Society, and President of the British Association for the present year, whose physiological writings, and whose late explorations, showing the existence of animal life in the sea at the depth of several miles, have lately excited much attention; and Mary, who in the field of active philanthropy stands eminent among the distinguished women of her time. William Benjamin, who took his name from one of the Kennaways, married a daughter of Joseph Powell, who was a partner of John Milford, also engaged in the woollen trade with the Continent.

Among remarkable Exonians connected with the same trade, the name of John Cranch * is well entitled to notice. A short biography of this remarkable man will be found in the introduction (written by Mr. Barrow, Secretary of the Admiralty, for whom I furnished the materials) to the narrative of the proceedings of the Congo Expedition, under Captain Tuckey, also a Devonian, which Cranch accompanied as zoologist, and there perished, with most of the party. He was particularly patronized by Colonel Montague, of Kingsbridge, and by Dr. W. E. Leach (another Devonian), the Curator of the British Museum, whose over-enforced studies brought with them insanity and premature death. Richard, the father of John Cranch, was a fuller—fond of music, and one of the many who benefited by the instruction of Jackson,†

* Hawkins, *Kingsbridge*, states that John Cranch was born at Exeter in 1785, of Kingsbridge parents. Died 4th September, 1816, *at* 31.—R. D.

He was not born of Kingsbridge parents. His father was a journeyman fuller (Richard), and he married Jane, eldest daughter of John Bowring, my grandfather.—J. B.

† Jackson excelled in painting as well as in music. Died 1803, and was buried in St. Stephen's Church, Exon. His son William acquired a fortune in the East, and married Frances second daughter of Charles Baring, and sister of Lady Northcote. Was sheriff of Devon 1806, and died at Hampstead 14th May, 1842.—R. D.

the organist of the Exeter Cathedral, whose influence created a musical taste among the Exonians, and whose songs, particularly

“Time has not thinned my flowing hair,
Nor bent me with his iron scythe,”

were in his days passionately admired. The fame of the Exeter organ stood next to that of Haarlem, in Holland, and its pipes were deemed among the largest that had been constructed. One of the Wesleys afterwards filled the place which had been occupied by Jackson. John Cranch was the discoverer of a new species of sea-crab, found in the largest of British sea-shells—the *Pinna ingens*. Dr. Leach gave it the name of the *Pinnatheres Cranchii*.* Being left an orphan, he was bred by an uncle to the humble trade of a shoemaker, in which capacity he visited and had a stall at the country fairs in the neighbourhood; but he deserted the employment for the study of natural history. He passed whole nights with the dredgers on the Devonshire coast; wrote articles in a local periodical called *The Weekly Entertainer*; assisted Mr. and Mrs. Montague in their researches, particularly in the capture of rare and curious birds. His account of the Hermit Crab affords an excellent example of accurate observation of the habits of this singular creature, seeking protection for the softer parts of its body, and migrating from one deserted shell to another for the accommodation of its growth. The daughter of John Cranch has also taken her place in the literary world, and has written some observant descriptions of the times of the persecuted Puritans, with whose race her ancestors were associated. The three Adamses of the United States—John, John Quincey, and Charles, were connected with the Cranch family through Judge Cranch, who migrated from Kingsbridge to America.

It is to be wished that more were done to preserve the histories of the illustrious obscure. In the literary field, from Sir Thomas Bodley, who founded the Bodleian Library, and in the poetical department, from the much earlier date of the *Swan of Isca*, names might be found well worthy of commemoration. The library still preserved in the archives of the Cathedral of the Bishops of Exeter anterior to the Conquest, is among the most valuable relics of Anglo-Saxon literature. Of painters, the list is extensive; of engravers, the living Cousins; of sculptors, Edward Bowring Stephens;

* In a note from Mr. Parfitt, correcting one of my errors, he states that the name of *Cranchii* has been sunk in that of *Pinnatheres pisum*, of which crab the *Cranchii* is the female.

of glass-stainers, Collins ; will represent the earlier hereditary claims to fame. The names of most distinguished lawyers, from Lord Chancellor King down to the present Lord Hatherly, whose father, Sir Matthew Wood, born at Tiverton, passed his early youth in a shop in High Street, Exeter, Sir William Follett, and others, would make a remarkable list, in which the Coleridge family might be becomingly noted. Of medical men of high reputation the list would be remarkable ; and George Bidder, born at Moretonhampstead, might well represent the scientific talent, of which Exeter and its neighbourhood may be proud. The oldest among our British, and without doubt the most illustrious in descent, is the Courtenay family ; and there is no region in Great Britain in which so many individuals can trace back their forefathers to times antecedent to the Norman Conquest—none in which the Anglo-Saxon type has been so singularly preserved ; for of 4,000 names of places in Devonshire, 3,800 bear Anglo-Saxon names.

Among many foreign settlers, whom the prosperity of the woollen trade brought to Exeter, was Hermann Katencamp, who migrated from Bremen, invited by his fellow-townsman, Matthew Baring. A daughter of Katencamp was the ancestress of the Merivales, who trace their Devonian origin to a Presbyterian minister, Samuel (born 1713), the friend and correspondent of Doddridge, Lardner, Toogood, and other leading Nonconformists. His grandson, John Hermann, was well known in the literary world ; and speaking of his *Orlando in Roncesvalles*, Lord Byron wrote to him, “ You have written a very noble poem, and nothing but the detestable taste of the day can do you harm ; but I think you will beat it. Your measure is uncommonly well chosen and wielded.” He published translations from Dante, Schiller, and from the Greek Anthology in Association with Bland. Of his descendants Hermann, the present Under Secretary of State for India, and Charles, formerly Chaplain of the House of Commons, and now Dean of Ely, the contributions to history and political economy are well known. Their mother was the daughter of Dr. Drury, Head Master of Harrow.

The founder of the family of Duntze, who came from Bremen, was an Exeter woollen merchant (whose warehouse was the new dwelling now occupied by Mr. Latimer), as were the ancestors of the Kennaways, Milfords, and Nations, and other considerable families. As in the great manufacturing towns in the North, the leading merchants of Exeter were Nonconformists, and their exclusion from public offices and

posts of distinction directed their attention to commercial and manufacturing pursuits, and the consequent acquisition of present fortune and future fame. Most of the great names of Exeter in the trading field will be found in the records of the dissenting chapels, and of the Presbyterian school in Paris Street (lately rebuilt), such as the Mackworths, Praeds, the Stokeses (intermarried with the Davies, of Creedy), the Vowlers, the Walronds, the Foster Barhams, the Lees, and various other notabilities, of whose descendants perhaps not one is now to be found among the dissenters from the Church of England.*

William Bowring (*obit* 1827 *æt* 61) was a clever solicitor, popularly known as Turney Bowring, and was perhaps the most prominent member of the Presbyterian or Unitarian Meeting House in the Mint, which, in the beginning of the last century, was the scene of the labours of the great heretic of these days, James Peirce, whose monument was, on the breaking up of the Mint Congregation, transferred to the vestry of George's Meeting. There used to be four Unitarian, or Arian, ministers in Exeter, three of whom served George's Meeting, and the other the Mint. William Bowring published an account of the trial of Winterbotham for a seditious sermon. He was convicted and sentenced to two years' imprisonment, though he had neither used the text, "Bind their kings in chains, and their nobles in fetters of iron" (a fine hexameter by the way), nor uttered the discourse attributed to him. But those were days of blind persecution, and Winterbotham was sentenced because one man on the jury told eleven foolish and timid colleagues that he had made up his mind, that he had a supply of food in his pocket, and would starve the others out. They thought starvation was worse than perjury, and "guilty" was the announcement, to the disgrace of justice and astonishment of the court. He was the grandfather of the present Under Secretary of State in the Home Department.

The portraits of many Devonian celebrities figured in the great National Portrait Exhibition. Connected with the Exeter trade was the first Sir Francis Baring; Sir Stafford Northcote, who married a Baring; Sir Matthew Wood; the first Lord Gifford, whose father was a hop merchant in High Street; Sir W. Follett, son of an Exeter timber merchant; Dunning, the first Lord Ashburton, who took his title from his native place, and had a Baring for his wife; Dowton, the

* Among the Exeter families who have left the Nonconformists are the Sandersons, who were Quakers within the present century.—R. D.

comedian, whose father was gardener to Robert Kennaway, an Exeter woollen merchant. Of Devonian painters, Sir Joshua Reynolds, James Northcote, R. Haydon, and others, have left portraits of many of their contemporaries; while many men of science and literature, Dr. Buckland, of Axminster, James Kendal, of Dartmouth, and the Coleridges, of Ottery, occupy no undistinguished positions.

I must, however, avoid entering into the wide field of exploration to which our county and city invite me, and feel gratified if what I have said has either amused or instructed you.

The Notes with which I have been favoured by Mr. Robert Dymond afford additional evidence—though that was not needed—of the extent of his acquaintance with all that concerns our city and its neighbourhood.

ON THE PROGRESS OF ELECTRO-THERAPEUTICS;

WITH A DESCRIPTION OF GALVANIC INSTRUMENTS INVENTED BY
THE AUTHOR,

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(Read at Exeter, July, 1872.)

THE object of the present paper is not to ask for electricity a recognition of any claims to be ranked amongst curative agents, nor to offer any apology for introducing it as a subject for the consideration of the Devon Association. The attention which it has for many years excited, and the increasing interest which has prompted the clever clinical lectures on the subject, and the animated discussions of still more recent date, fully establish the former, and supersede the necessity of the latter.

My object is to endeavour to throw into the fund of general experience a few facts and observations gathered in the course of nearly half a century's devotion to the study of electrical science, and its collateral employment as a therapeutical agent throughout the same period.

Taking it for granted that my hearers are all familiar with the three forms under which electricity has been employed as a curative agent, namely, Franklynic or Static, Voltaic, and Faradaic or Electro-magnetic, I shall proceed at once to give a few of my own experiences, and notice some facts not generally alluded to by writers on Electro-pathology of the present day.

First, with regard to Franklynic Electricity. There was a time when this form of administering electricity was the only one, if we except the occasional use of the Cruikshank's form of Voltaic Battery, available for electricians, and it was with this I first experimented in Electro-therapeutics. There were three principal modes of applying it: 1st, the Spark; 2nd, the Shock; 3rd, the Aura.

FIRST—THE SPARK.

The ordinary mode of administering the Spark was very defective; it was usually done by placing the patient on an insulated stool, and connecting him with the prime conductor of the machine. A brass ball held by the operator was then passed over the part of the body to be electrified outside the clothes, and a series of small pungent sparks, varying in strength according to their length, thus passed between the surface of the body and the brass ball through the clothes of the patient. If the clothes were damp, or composed of any material but silk or wool, these sparks could not be obtained, unless a flannel covering of some kind were laid over the portion of the dress through which it was necessary to draw the sparks.

To remedy this, instead of holding the brass ball in the hand, I contrived an interrupted director, by which I could vary the length and strength of Spark at pleasure, and obtain it through the clothes under all circumstances.*

I do not think that the value of the therapeutic effect of the Spark has been sufficiently appreciated.

It had powerful rubifacient properties, and excited vascularity in the cutaneous tissues, and was extremely efficacious in exciting superficial circulation where languid.

In rheumatic affections it frequently acted rapidly and beneficially.

I observed almost invariably that after a general surface electrization, the action of the heart, as indicated by the number of pulsations, was reduced ten and fifteen per cent. Chilblains, sore throats, and asthmatic affections, yielded quickly to the influence of the Spark.

SECOND—THE SHOCK.

This knock-me-down process, under the usual mode of employing it, occasionally produced very serious mischief. The injudicious shocking of a joint to restore nervous energy after a dislocation often resulted in inflammatory action; but by reducing the strength of the Shock, and administering a rapid reiteration of very small ones instead of a few strong ones, the contrary effect was produced under corresponding pathological conditions.

For this reason I reduced my leyden jars gradually to small coated tubes, from which I could obtain small shocks in such

* This instrument is described and figured in "Phylokanmonian" of June, 1830.

rapid succession, as to be able to hold an individual as firmly fixed to a pair of brass handles as he often is now under the influence of the coil machine, and this long before coil machines were dreamt of. Precisely the same therapeutic effects were produced by this process as by the present one of Faradizing.

THIRD—THE AURA.

This valuable form has been almost entirely overlooked by chroniclers of electro-therapeutics.

The Association would scarcely credit the number of cases of inflamed eyes, and obstinate ulcers, and even of neuralgia, which were cured simply by throwing the Electrical Aura or breeze from a wooden or metal point upon the part affected.

The facts were numerous and indisputable, though the rationale was unknown.

Now, however, perhaps we should not be far wrong in ascribing them to the action of ozone, since we know that the Electrical Aura is one of the most fertile sources of its development.

This may be easily shown by a very simple experiment. If paper coated with a preparation of iodide of potassium and starch, commonly known as ozone test paper, be moistened and passed before an electrified point, a deep blue stain is instantly produced, and by moving the paper, the point may be made to trace blue characters upon it, as if written with a pencil.

At a Meeting of the Devon Association, held at Tavistock, I proposed that ozone developed from frictional electrical machines should be used in hospitals as an antiseptic or disinfectant; and I find that the same suggestions have not only been made by others, but apparatus have been contrived for developing it for this purpose from the Induction Coil.

INDUCED ELECTRICITY.

Deferring for the present any remarks on the early attempts to substitute Galvanism for frictional electricity as a therapeutic agent, I come at once to Faraday's grand and very opportune discovery of the development of Static Electricity by the magnetic reaction of the Volta Electric Current, which gave a sudden impetus to electrical investigations in a new direction.

I believe I was one of the first to apply the discovery to the construction of what is now called the Induction Coil, and certainly the first in England to show the extraordinary

statical effects capable of being developed in the secondary coil, from the magnetic re-action of an included iron core.

My large Induction Coil, and some of the investigations made with it, were laid before the Plymouth Institution in 1856, and the Society of Arts and the London Institution in 1857, and I had been previously honoured with prizes from the Royal Cornwall Polytechnic Society for this invention.

It was merely an extension of the principle upon which my medical coil was constructed.

Without reviewing the numerous forms of the medical coils now in use, I may be pardoned if I briefly remark on the almost universal absence of what appears to me a most important element in their construction, namely, the establishment of a unit of force, and an accurate and definite system of graduation, by which experimentalists may be able to compare notes with each other.

In the construction of my medical coil to which I have the honour to draw the Society's attention, there are three important features, not, I believe, to be met with in any other Faradaic instrument.

1st. The electro-motive force of the battery and resistance of the coil are so exactly adjusted to each other, that a single small Smee's Battery, with about four square inches of platinated silver immersed, produces a very high magnetic development in the core.

2nd. The employment of a strong spring interrupter, which can be made to vibrate some hundreds of times per second.

3rd. My double index principle of graduation.

I employ two indices—one moving over an arc giving from one to eight degrees of force; and the other, like the minute hand of a clock, passing over a second arc which subdivides these degrees into quarters, thus quadrupling the number of increments.

Each degree of force is obtained by a definite length of secondary coil.

The value of this machine in obstetric practice was recognised by Dr. Barnes, of London, at whose suggestion I introduced certain modifications so as to increase its compactness, and render it a suitable "Vade Mecum" for the medical and obstetric practitioner; and I have only to refer to the remarks contained in a lecture delivered by Dr. Barnes, reported in *The Lancet* of November 12th, 1854, to show how far I succeeded in accomplishing the object.

The late Dr. Marshall Hall welcomed this machine with most unbounded satisfaction, "since by its means," he said,

"electricians need no longer misunderstand each other by experimenting with apparatus which did not admit of comparison, but that they could now compare notes with the greatest accuracy."

The following case illustrates the value of my index mode of graduation as a means of diagnosis and a measure of the difference in certain pathological conditions.

Dr. Marshall Hall, knowing that I had frequent cases under treatment, asked me to take particular notice of the various strengths of current required to produce equal amounts of muscular contraction under different conditions of reflex sensitiveness, and to note the degrees indicated on my machine. This, he said, would enable him to compare his notes with mine. The results were that, as a general rule, where the reflex sensory functions alone were impaired, muscular contraction was excited with a much less amount of power than when the reflex functions were in a normal condition, probably arising from the involuntary controlling action which the sensory nerves may exert over the nerves of volition, thereby modifying the development of a force which, if uncontrolled, might have been considerably greater.

A labouring man fell from a horse and bruised his neck on the left side : the result was an entire paralysis of the sensory powers of the left arm, while the motor powers remained intact. He could do any work or hold any article as long as his attention was directed to it ; but the moment his attention was diverted, the article would fall from his grasp. He could tie his neckerchief if he stood before a glass, but not else. On one occasion he chopped off a piece of one of his fingers, and on a second sawed off the top of another, without having been aware that he had done so until he saw the mischief.

Placing him under Faradaic treatment, remarkable effects were observable. A current which produced a very slight action in the right or normal arm excited the other so violently that I unwittingly received two or three tremendous thumps from the sudden contractions.

The motions produced were beautifully true to the influence of each individual muscle as it was separately Faradized ; and the contortions of the limb were such as could not possibly have been excited, either by the strongest Faradization which the patient could bear, or the most intense volition which he could exert in the normal limb.

I once noticed a similar effect on passing the Faradaic current down the back of a cholera patient *in articulo mortis*, and immediately after death.

After life was extinct the reflex curvature of the spine, under a current which would scarcely have been appreciable in health, was something marvellous, and very nearly caused the body to twist out of bed.

In the case of the Anæsthetic arm just described, it was easy to note the difference between the degrees of force necessary to produce equal muscular contractions in the normal and abnormal limb, and to watch the controlling influence which the gradual return of sensation produced over the involuntary contractions resulting from electrical influence.

Again, two limbs may differ widely in their sensational susceptibility to electrical impressions, and this instrument measures accurately the difference between them, and affords a precise mode of registering the progress of convalescence.

Before dismissing the subject of Induced Electricity, let me briefly refer to some vague notions which seem to be afloat respecting the nature of so-called primary currents; that is to say, currents obtained from a primary wire alone, without the addition of a secondary one. These notions arise from an ignorance of the fact that the currents obtained from primary coils are really secondary ones, and only differ from those obtained from the secondary coil proper in being limited to a given degree of strength, determined by the length of primary coil. They arise, not from the battery current which excites the magnetism in the core, but from the wave of electricity produced by the cessation of magnetic reaction at the moment when the circuit is broken.

Increase of power in a primary coil is obtained by the employment of a greater number of battery cells, which only serve to produce a stronger magnetic development in the core, and consequently a stronger wave when it suddenly returns from the magnetic to the normal state.

In the machine, however, which I have introduced to the notice of the Association, the magnetic changes of the iron core are always maintained at their maximum degree, and the amount of secondary current employed is therefore not governed by any modifications in the magnetic intensity of the core, produced either by the uncertain and objectionable modes of increasing battery power, or inserting and withdrawing the iron core, but by varying the length of secondary coil embraced in the circuit by accurately measured increments, each of which adds a known quantity to the general effect.

The action of these intermittent currents is precisely

analogous to that of the leyden jar of the frictional apparatus, differing only in degree.

Each small impulse arises from the transmission of a minute though definite quantity of electricity, in a given direction, through a portion of the system included between two rheophores, and may be confined to a very small spot, or may embrace the whole length of the body from head to foot.

As in the leyden jar the quantity can be increased by extending its surface, so in the machine before the Association the strength is increased by bringing into action a greater length of wire; the resulting pathological symptoms are therefore precisely similar in character in each case, and are purely electrical. It is thus clear that since the current developed by the reaction of magnetism increases in proportion to the length of secondary coil, the battery and primary coil remaining the same, the extent to which the power may be accumulated is indefinitely great; but for therapeutic purposes, I find a range of from 20 to 32 of my standard units of force adequate for all therapeutic purposes.

VOLTAIC ELECTRICITY.

We now come to the consideration of another form of administering electricity, namely, the Voltaic, Galvanic, or Continuous Current.

About half a century since, attempts were made, with various degrees of success, to substitute Galvanic or Voltaic Electricity for that obtained from the glass frictional machine.

The galvanic troughs invented by Cruikshank, and improved by Dr. Wollaston, were called into requisition; but although they presented less difficulty in their management than the frictional machines, which required skilful manipulation, and the adjunct of fine weather for their success, they were scarcely less objectionable, on account of the inconvenience of using acid to excite them.

I believe I was the first to make a portable Voltaic Battery. It was based on the principle of Volta's Pile, and consisted of circular discs of copper and zinc, soldered together in pairs, perforated by a hole in the centre, and strung upon a horsehair line, with discs of cloth to separate them from each other. This little battery, being armed with flexible wires and suitable rheophores, was, after being moistened with vinegar, either rolled up in oil-silk and carried in the waist-coat pocket, or inserted in the hollow handle of a walking-stick, or in the walking-stick itself; and I know of none of

the miniature contrivances, in the form of chain bands, &c., which surpass this in efficacy, as far as it goes.

It was, however, like all analogous contrivances, too transient in its action to be of very general use, and Voltaic Electricity received a sort of deathblow when Faraday made his great discovery of Magneto Electricity.

Of late years, however, the use of the Voltaic or Continuous Current appears to have gained favour among the Continental therapeutists, and the translation of the results of their labours into English has excited a considerable amount of interest amongst the medical profession in London and elsewhere.

Several elaborate and ingenious forms of apparatus have been contrived for applying the Continuous Current, but they all possess the rather objectionable qualities of costliness and want of portability.

This has induced me to turn my attention to the subject, and I believe I have succeeded in producing a Continuous Battery which combines simplicity with efficiency and readiness of action, power with economy of space, and above all, economy of price.

The little battery which I have the honour to exhibit to the Society contains fifty elements, developing a power sufficient for all therapeutic purposes in a space of $12 \times 8 \times 11$ inches. It is always ready for use, requiring merely that a trough of dilute acid contained in the bottom of the box shall be raised so as to immerse the plates for a few moments, and then lowered again.

The quantity of acid retained by each of the fifty elements is sufficient to keep the battery in action for some hours; any decrease of power is instantly restored by repeating the immersion for a moment.

The zinc plates consist of strips of stout zinc half an inch wide and four inches long, fastened in rows to a plate forming the cover of the box, and projecting down into the interior.

Each plate of zinc is first amalgamated, and then surrounded by a piece of cloth, round which is wound spirally a copper wire so as to leave interstices between the coils.

One end of each coil is left long enough to solder fast to the next plate of zinc, so as to keep up the continuity of the series from one end to the other.

An arc of ten metallic buttons is placed on the upper plate, having stems which project into the interior. Over these buttons a metallic spring hand passes, and wires from the ends of the metal stems within are connected respectively

with five, ten, fifteen, up to fifty of the elements in a series below; thus giving the facility of modifying the power at pleasure.

The whole of the interior in working order lifts out of the mahogany case which contains it, and the portability is such that even with a little care it may be carried about without spilling the acid contained in the trough below.

For my own part, I am quite satisfied with it as a practically useful instrument, and my experience in these matters extends over nearly half a century. I make a more powerful form of this battery by substituting small platinised silver plates for the copper coils, and giving each element a small glass cell in which to retain the acid, the latter being lifted as before simultaneously for the purpose of exciting it.

Medical science is and will be greatly indebted to the earnest labours of those who are now prosecuting Electro-therapeutic investigations in relation to the Continuous Current, and I would venture with deference to throw out a few suggestions which may not be unworthy of consideration.

Two great principles have to be borne in mind in relation to the transmission of electricity, namely, *electro-motive force*, and *resistance*.

We hear much of the great desideratum—a constant continuous battery; that is, I presume, a battery always ready to yield a current of uniform strength.

Time will not permit me to show that this is about as feasible as perpetual motion; but, limiting the period of its constancy within practical bounds, uniformity of effect is impossible when the circuit upon which it operates varies in its conducting character. The amount of current flowing between two terminals will vary with every change of position on the surface of the human body.

Thus no two effects can be correctly compared, since the currents producing them are constantly varying.

If a current from half a dozen couples be flowing with a certain intensity through a certain portion of the body, the shifting of the rheophores a few inches will so vary the resistance of that part of the circuit as to require the employment of a greater or less number of elements to enable a current of equal force to be transmitted. My new battery, however, meets this difficulty at once.

Again, before correct therapeutical deductions can be drawn, the electrical functions and character of the various tissues and nerves, both under normal and abnormal conditions, have to be more correctly ascertained.

The difference in the conducting character of muscles and nerves is extraordinary; and even muscular fibre varies in the resistance which it affords to the electrical currents, accordingly as they are transmitted transversely or longitudinally through its mass, or through its nervous or tendinous attachments.

This can be easily and practically demonstrated in the following way.

Let two individuals be included in the same Faradaic circuit, one holding permanently a pair of metal handles, whilst the circuit is completed by including within it different portions of the body of a second subject. The one holding the shock handles will be sensibly aware of the difference of effect produced upon him when various portions of the muscles or nerves of the second subject are included in the circuit; and it is a curious fact that, whenever the nervous or muscular excitement is greatest in the subject submitted to treatment, the sensation is correspondingly great in the one acting as the rheoscope.

Time forbids me to extend the length of this paper. I must therefore close by remarking, that it is scarcely possible in abnormal conditions to apply electricity to corresponding portions of the body on opposite sides, without discovering a marked difference between the susceptibility of the two limbs to electrical influence, either in regard to sensory or motor power.

Much will have, for a long period, to be gained by empirical observation, and a careful registration of observed facts, since the most unexpected results are daily obtained under circumstances which no prognosis would have indicated.

The instruments which I have brought before the notice of the Association will, from the uniformity of their action and construction, not only assist in the comparison of results amongst different experimentalists, but, from their peculiar adaptability to therapeutic purposes, facilitate the application of electricity as a curative agent.

SOME ACCOUNT OF THE ANCIENT GUILDS OF THE CITY OF EXETER.

BY W. COTTON.

(Read at Exeter, July, 1872.)

THE earliest account of guilds in connection with the city of Exeter occurs in Sharon Turner's *History of the Anglo-Saxons*. One guild he mentions was composed of eighteen members, who undertook the association in mutual fraternity, and it was allowed by the bishop and canons. It was not strictly a religious guild, but appeared more to resemble a modern benefit society. A second (religious) guild is also mentioned, which was established by the fraternity for God's love and their souls' need.

In mercantile towns and seaports, even in Anglo-Saxon times, guilds were constituted for the purpose of carrying on more successful enterprises in commerce. After the Conquest they became more numerous, but none could legally be set up without the King's license. If any person erected a guild without a warrant, *i.e.*, the King's leave, it was a trespass, and he was liable to be punished for it. In the twenty-sixth year of King Henry II. several guilds were amerced for being set up without license.

The mayor, bailiffs, and common council of Exeter exercised the privilege of licensing trade guilds from an early period. Hoker (MS.), writing of "trybes and corporations," says: "The whole city, according to their duties and occupations, be all reduced into several companies; every one of these have their particular governors to direct them, and govern them in their several duties, which is a great ease to the mayor of the city, he being thereby not troubled with their causes. Of these some being incorporated by the prince and some by the mayor of this city. The first and most ancient of these are the tailors, who were incorporated by King Edward IV. Between them and the whole city there fell a controversy, which was very troublesome for the time, and in the end it was brought before the King himself, who,

being loth to revoke his grant, and yet listening to the sundry requests made unto him of sundry wrongs and grievances done to the mayor and commons, he did with the advice of his council consider the same, and by his decree did qualify and redress the matter as a quietness." "Yet the malyce and gref whch was conceved hereof could not yn longe tyme be satisfied nor appeased."

The quarrel arose from the tailors obtaining their charter direct from the King, which proceeding was considered prejudicial to the liberties of the city, and to the authority of the governing body. The dispute was carried on for some time with intense bitterness; and even after the King's award had been given, there were bickerings and heart-burnings for some twenty years, until the mayor and corporation, on petition, got the hateful charter annulled.

A full and interesting account of this quarrel, with the King's award, is given in Toulmin Smith's *Early English Gilds*. As a specimen of the language of the period, we are told the mode in which the tailors enforced payment of fees from objecting member—how "modo guerrino arraiati vi et armis, videlicet jackis, doblettis of defence, swerdis, bokelers, gleyves and stavys in domo" of the offender, they went and beat him.

The Cordwainers' Company was first incorporated by grant under the common seal of the city, which grant was confirmed in 1481, and again in 1555. One of their ordinances enjoined the master and wardens to wear their livery, and in the same to attend upon the mayor at all callings. The last charter granted by the city was made to be void for sundry imperfections in the form, and a new one was made unto the said company according to a statute in the twenty-first year of King Henry VII.

The Company of Brewers also obtained a new charter in 1578. There were also the Societies of Weavers, Tuckers or Fullers, and Sheremen, of Cappers and Haberdashers, of Skynners and Glovers, of Smythes and Cutters, of Coupers and Hellyers, of Boutchers and of Bakers. This latter company, according to Isacke, was constantly in trouble with the authorities.

The Incorporation of Carpenters, Masons, Joiners, Glaziers, and Painters, was established at a later period. There is a copy of their grant from the mayor, &c., in the muniment room, in MS., and it contains a curious and elaborate petition by the fraternity. The document is dated 29th March, 1586, and the following is a portion of its contents :

“Charter of Incorporation of Carpenters Masons Joiners
Glaziers and Painters.

“ To all Christian people to whome theis presents shall come.

“ The Mayor Baylyffes and Comynaltye of the Citye of Exeter sende greetinge. Whereas our lovinge neighbours and citizens the artyficers of the Companye of Carpenters Masons Joyners and Glaziers and Paynters of this Cyttie and County of Exeter have eftsoones and one long tyme beene ernest sutors and petitioners unto us that they might be made and brought into one societeye fellowshypp and companye do by there humble peticion in writinge to us exhibited the wordes whereof do ensue it doth more playnely appeare—‘To the Rigithe Worshippfull Maior Aldermen and Common Council of the Cittie of Exeter with all humblenes. It is not unknownen unto your wisedomes right worshippfull howe that Citties and comon welthes had there first foundation and grounde upon the polytuyque govermente of the prudente magystrate and the dutifull obedience of the good subjecte; for in the first age when men lyved at libertye and without order and then lothinge there lose and uncertayne state of lyfe dyd assemble themselves and made choyce of the wyse and prudente men to go before them and to governe and rule them who in wysedome directing and the people in humblenes obeying, they grewe in strength and increased in welth and able to mayntayne the comon state and pryvate famyly, and then citties and townes began to be builded, good men for vertue to be honured, and wycked men for synne to be punyshed, then were wholsome lawes constituted cyvil orders devysed and polytiuque ordynaunce establisched as well for the preservation of the comon state as also to kepe ech man in his estate and callinge. And as all citties and comon weiles were first settled thys so good a foundation, so they restinge upon the same have had ever sithens there countinans. Wherein whatsoever may be said or thought of other citties and townes yet wee do thinke veryly that this Citty of Exeter now under your goverment in both respects as happy as any others, having beene from tyme to tyme governed and preserved by prudente magistrates and wise governours. And truly in our opynion in no age better than in this of ours wherein yt appeareth how carefully and paynefully youe nowe the governors have and tender the goode govermente prosperitye and increase of this Citty and Comon welth of the same, levinge no presidents of any other well governed Cittye nor any good devise of your owne nor whatsoever els which in any respecte maie be to the

furtherance thereof. And therefore partely bie the example of other well governed citties and partlye by your owne experiance fynding agreeable it is to the worde of God and lawe of nature howe necessarye and needful it is yn the Comon welth that ech man do lyve in his owne vocation and callinge and in such arte and mysterye as he is most skilfull of and hath bene trayned in. You have with greate wisedome and upon considerations reduced the experte and fynally the whole comon welth in better case, experiance sheweth and declarereth. Wee therefore your poore neighbours and orators the Carpenters, &c., of the Cittie of Exon, albeit fewe in number and slender in welth, beinge desirous to be partakers of so many good benefits whereby we myght become and bee the more profitable members in the Comon welth the better hable to serve therein under youe and by the sweate of our browes in our own mystere and callinge to gett our lyving to the maintenaince of our selfs wyffs children and famylye, do most humbly besiech and praye youe (as wee hope youe will) to have the like considerations of us as youe have had and have of other mysteres,' ' &c.

Of course, they obtained their charter.

The spirit of adventure, and the desire to extend and encourage the mercantile operations of the country, the chief characteristics of the age, brought forth the Guild of the Merchant Adventurers trading to France. In the power with which they were endowed, in wealth, influence, and importance, this guild far exceeded all the others. The book of minutes of their proceedings, from 1560 to the beginning of the 17th century, is in possession of the Society of Weavers, Tuckers, and Sheremen; and by the courtesy of the master and wardens of this latter guild—the only one which has survived to the present day—I am indebted for much of the information concerning the merchants, as well as their own guild.

To these two companies and their proceedings I must chiefly confine myself.

Hoker (MS.) says: "The merchants are not the ancientest, but most wealthiest company, and first procured a charter from Queen Mary, and then by Queen Elizabeth which now is, and against these and their corporation, the tailors especially, with the assent of certain commoners joined with them, did insult and impugn against the merchants and their corporation, and made great complaints to the Queen of the wrong supposed to be done against them."

The minute book of the society commences as follows:—

" Be it known that in the moneth of Januarii Anno Dom 1558 the most Gracious and Sovereigne Ladye Elizabeth by the Grace of God of England Fraunce and Irelande quene defender of the faithe etc dyd geve and graunte by her Letters patentes that ther shulde from hensforth a Societie and Companye of Marchant Adventurers graunted by the name of a Societie of Marchante Adventurers of the City of Exon unto one Governour and four Consultes of the same with others whose names do here followe :—

Mr John Buller Maior

Mr John Peter Governor of the Company

Four Consultes (and ten others, named)

which shall be sworne to observe mayntaine and kepe the articles and effect of the said graunte have chosen and elected to them to be both of this Societie and also Assistantes to the foresaide Companye and have also elected and chosen into their Companye and fellowship all others as have besides them bene Contributories to the obliging and procuring of the foresaide letters patentes. The names of all which Assistantes and Contributories doo here folowe :—

The Assistantes

First Mr John Blackalle the Elder and twenty others (named)

The Contributories

Andrew Gere and seventeen others (named) and further also the foresaide Companye have elected and chosen into the Societie of the Merchantes Adventurers those whose names do here folowe :—

" John Hoker and ten others (named) which whole Companye aforesaid being congregated together dyd take their othes and swore in manner and forme as hereafter followeth and lykewyse did ordeyne and establishe certen ordynaunces and rules to be observed and kept most fyrmly of all such as be and shall be free of the Companye of the foresaid Merchantes Adventurers.

" The othe to be mynistred to the Governor and Consultes of the Companye of the Merchantes Adventurers of the Citie of Exon for the year beinge. By the Maior of the said Citie. Ye shall sware That ye shalbe good and trewe to oure moste Sovereigne Ladye the Quene's Highness by the Grace of God Quene of Englande Fraunce and Ireland defender of the faithe etc and to her heirs and successors Kings and Quenes of Englande and ye shall upholde and mayntaine all articles and grauntes comprysed in your Charter of Merchantes

Adventurers and all other ordynaunces and statutes of y^e same societie to the uttermost of your power for this present yeare following. Youe shall as often as is made require cause to be called together y^e Companye or as many as shall be required to sit and consulte for the reformation of all complainentes or wrongs committed or done by any of your Companye or others. Ye shall see to the uttermost of your powres that none of your Companye do sell deceitful wares or use any faulse weightes or measures. Ye shall geve in charge at your Assemblies to all and every of your Companye that they be of an honeste and discrete behaviour to the good ensamble of all the Quene's subjects. Ye shall dyscretlye and circumspectlie make and order such statutes and ordynances amoninge yourselves as shall not be hurtful repugnante nor prejudiciale to the Lawes of this realme nor the common welthe of this Citie of Exon. Ye shall with favor and gentleness use offenders putting aparte all cruelness and dyspleasure. All and singles these statutes ye shall well and truelie kepe. So helpe ye God."

[In the minute book the name of the Sovereign is altered to "James," and then to "Charles." The word "Scotland" is interposed between England and France in a different hand-writing.]

Then follow :—

The othe of the Threasurer ; and "The othe to be mynstred to every one which is and shall be made free of the Companye of the Marchantes Adventurers of the Citie of *Excester*."

The Charter of the Merchant Adventurers granted by Queen Elizabeth in 1560 conferred great powers upon this company. In their minute book there is a memorandum to the effect "that on this 8th day of June, 1570, at a Court then holden, order was taken that the 'newe or laste' Charter shulde be translated into Inglyshe and written and worded in this book."

The Charter is partly to the following effect :—

"In consideration of the good trewe and faithfull obeydience and service done by the Maior and Citizens of our Citie of Excester as well in the tyme of our moste well beloved graundfather Kinge Henry the Seventh as now of late in the time of oure well beloved brother King Edward the Sixth," and to abolish "sundrie absurdities" by reason of the "excessive nomber" of inexpert artificers who take upon themselves the "arte scyence and mysterie of marchandize" to

the prejudice of the common weal, license is given to certain persons to form themselves into a body corporate, &c.

Power is given to the company to hold land, &c., so that the yearly value did not exceed one hundred marks.

No citizen or inhabitant of the City or County of the Citie must "henceforth presume or dare to transporthe, delyver, shipp or convey any kynd of marchandize marchants wares or merceris to the realme of France or any other the King of Fraunce his dominions" nor bring in or convey the same from the same unless he be free of the company. Artificers might be admitted to the freedom of the company without charge for the first three years from the establishment of the society, but they must give up their own trade. Every person incorporated must "utterlie leave the arte of merceris and merchandize and the exercise use and trafique of the same."

The company had the power to search "among all the trafiquers," correcting and reforming, and abolishing defaults; to examine all weights and measures, and to punish, where necessary, by "due and lawfull manes."

One half of the fines the company imposed was to be paid to the Chamber of the Commonalty, the other to the company, without "accompte or any other thinge to be rendered paid or done."

In consideration of all which and singular premisses the governor and company faithfully promise that they will distribute yearly twelve "garmentes of clothe" to twelve poore and impotent people of the said Citie, and that they will assist their poor brethren to the best of their ability.

It was not likely that the pugnacious "tailors," at that time the chief of the guilds, would allow such a powerful corporation to overshadow them without a struggle. The Charter had scarcely been conferred when the tailors enlisted on their side the weavers and tuckers, the bakers, the brewers, the cappers, the dyers, the shoemakers, and, according to their own account, all the freemen of the city. They send a petition to the Queen, praying that a commission may be appointed to enquire into and report upon their complaints, which petition runs as follows:—

"One John Buller the Elder Merchant now Maior of the saide Citie of Exeter and certen other inhabitants within the said Citie upon certen pretenses suggestions and surmises by them rather of a covetous and greedy desier of luker invented and imagined they without any just ground or cause as by the sequele of the same to your honor shall plainly appear have of late opteyned at the hande of our

most gracious Sovereign Ladye the Quene's Majestie a speciall graunte by Her Highness lres patente that they should be incorporate," &c. &c.

They complain of the powers conferred upon the company, the only check being the mayor and four aldermen, "who are and are like to continue members of the said company;" that since the Charter was granted your "Orationers" and all other the inhabitants and freemen of the said county of Exeter have been impeached and interrupted from the aforesaid liberty and benefits of their freedom which tyme out of mind they lawfully have used to have not only to their great decay and hindrance and in tyme to come like to be the extreme impoverishment and undoing of all the Commons within the said Citie—but also to the utter ruyn and destruction of the same Citie"—and other things "over muche tedious in these presentes to be expressed at large." They pray for a commission consisting of "men of worship" within the countie of Devonshire, or adjoining to the same, to enquire and report upon the abuses complained of.

The replication of the merchants insinuates that it is only those "busy seditious and noysome cuttyng tailors" who had fomented the disturbance, and that the other parties mentioned have nothing to do with it; and alleges that the new corporation would be to the great advantage of the city, and the country thereunto nigh adjoining.

Recrimination succeeds recrimination till the whole city is in a ferment—the suits continuing for just two years, when they appear to have resulted in victory to the merchants, who, however, make the following concessions:—

"That everie Taylor or other Artificer minding to use the trade of Merchant be received into the Company on payment of a reasonable fine—but that if he can't or won't be free of the Company, he is not to be prohibited of such his trade so that he will give a reasonable contribution by the year for a knowledge."

That he or they may buy every kind of merchandize actually to be used in the trade, but not to sell again unmanufactured.

That the guilds should be reduced to six in number, and that they every "man being ones free of the city, and of some one company, should have and enjoy all such freedoms and liberties as is in London;" and if there was anything prejudicial to this agreement to be found in the Merchants' Charter, then it too should be referred to counsel—one to be appointed on either side, and arrayed in "suche sorte as by them shalbe devised."

There are no minutes of the merchants' proceedings during the troublous times with the tailors. In 1570, when the Charter was ordered to be translated into English, it was copied at the commencement of the book, and the proceedings from 1560 to that date are evidently transcribed from another, the old minute book, which was doubtless destroyed, and all that related to the dispute probably purposely destroyed with it. The only reference I find to the subject is in a curious minute of 27th March, 1562 : "That in consideration of the paynes and travelles taken at three severall tymes by the said Gilbert Saywell at London in the suyte of and for their Companye the saide some and debte of v^l vj^s iiij^d shalbe trewlie allowed and geven to the saide Gilbert and to be trewelye acquitted for the payment of the same. So in the whole he hathe bene allowed for his paynes and travelle as foloweth :—

For hys firste journe to London when the Charter was first saved in money	ijij ^l	iiij ^d
Also a Gelding price	ijij ^l	vj ^s viij ^d
Item for his iii. last jorneis in money which was allowed in his debte . . .	v ^l	vj ^s iiij ^d
Sum xvj ^l xij ^s iiij ^d "		

The book commences 1560, with the names of William Hurst, Governor ; John Blackalle, Walter Staplegyll, Eustace Olyver, and Robert Cotton, Consultes ; with 60 other names as the Common Council.

A court is held on 29th Jany. in the same year, when John Peter is stated to be governor. Another court is held on 1st Feby., when certain applicants who had been properly examined and declared fit were admitted to the freedom of the company.

On the 6th August, 1560, the merchants had their first election and choice of governor, consultes, and other officers of the society, according to the form of the Queen's Majesty's letters patent. The court was held in the Chapel Chamber of the Guildhall of the city.

Mr. William Hurst is chosen governor, and duly sworn. Mr. John Blackalle and Mr. Walter Staplegyll, chief consultes ; and Mr. Eustace Olyver and Mr. Robert Cotton, second consultes ; with Mr. Richard Prestwodde, treasurer.

Matters now go on smoothly, and a formal record of all the proceedings appears as they take place. The treasurer is ordered to buy as much frieze as will make twelve gowns for as many poor men, to be presented in the terms of the

Charter, and to have the arms of the company set upon the sleeve—"lyons pawe holding the grapell."

Fines are instituted—for non-attendance, after due summons, xii^d; subsequently for a second offence 20s. is inflicted; and for a third offence, 40s. These courts are sometimes held as early as eight o'clock in the morning. For being late, or, as it is termed, "for his slackness," the fine is vi^d.

"If any of the 4 Consultes do come to any of the Courtes of this Companye without his gowne he shall pay 2s. 6d. without any remission." There are fines, too, for quarrelling and bad language; thus John Livermore and another are each fined 3s. 4d. for giving "unseemlie and unhonest wordes." And again, John Livermore "not onlie did speake unseemlie and opprobrious wordes to Richard Swete but also that Richard Swete speake the like wordes unto the said John Livermore," and they were each fined 3s. 4d. John Davye, for "ill-wordes," (they must have been very "ill," from the amount of the fine,) is mulcted of xx^s. Richard Denys, for "nastie words which he gave to another," was presented to the Court.

These penalties, it is presumed, are not severe enough, and it is enacted further that "none shall speke slanderous wordes" under the penalty of a great fine.

Any one brawling or fighting with another of the company shall be fined 6s. 8d., and any witness of the same not presenting the offence to the court is fined xii^d.

Infringements of the Charter are dealt with in the severest manner. The first offender is one Richard Strobridge, who comes to the court and compounds with the governor for that he "traffyqueth into Fraunce," not being free of the company, and is let off on finding a surety who guarantees that he shall not do it again. John Pyll, however, is fined £10 for the same offence, and the fine is enforced by the assistance of the mayor and aldermen; and John Peryn has to pay xx marks. If revenge is sweet to the merchants, how delighted they must be to have a tailor, one Robert Prowse, before them for having committed "certain brokes," in that "he hath ventured to Burdeaux in the parties of Fraunce in a Barke called the Robert of Exmouth and hath transported certen Wynes therefrom to London" contrary to the ordinances of the company, and must therefore pay £10.

There are various other fines for offences, such as going to law without the leave of the governor, xii^d; appearing without a gowne on certain occasions, xii^d, and neglect of appearance when called.

Any person refusing to pay a fine is to be committed to prison the next time he comes to the court.

Richard Selwoode and Richard Hickinge, being defaulters, are ordered to be committed to warde if they do not pay what they owe at their next home coming. At the next court they are both committed to the "Warde of the Guyldhall," but it is agreed that Selwoode shall be let off on paying part of the debt, and provided he leaves the city and goes to live at Charde.

One William Bucknam, a defaulter, not being provided with money, finds security and "brings into this house the pawne: A goblett Silver parcell gylte for the payment of £4: 13: 4 which he oweth," and upon his payment to "stande to the grace and favor of the house."

A dishonoured bill of exchange presented to the court, accepted by Richard Turberville, is a rare sight: he is ordered to deliver as much salt at 5s. a bushel within one week as should cover the debt.

The company regulate the terms for apprentices, which (1578) is fixed at not less than eight years, the "apprenticehode" to end before they attain the age of 24. They also settle disputes between masters and their servants. There is a curious compromise recorded in a minute of 13th October, 1562.

Peter Lake, refusing to "instructe and set forth in suche sorte as he is bounde to doo" his apprentice, Richard Newman, it is ordered that the said Richard shall be dismissed of his service; but in further consideration it was agreed that "the said Peter shall enter in obligation of one hundredth markes to the Governor &c to set furthe the said Richarde in a voyage to the parties beyond the seas on this side Easter next comming and that Eustace Olyver shall lykewise on the behalf of the said Richard Newman be bounde to answere the saide Peter Lake all such some and somes of money stocke or goodes as shal be by the saide Peter be commytted to the handes and truste of the said Richarde that therefore the saide Richarde shall retorne to the saide his maister's service and so to remayne with him in his service untill the ende of suche years as are yet remayning to come of his apprenticehode."

"Provided that the saide Eustace shall not stand to answere for any losse of the seas But onlie that the said Richarde shall trewlie answere his master in accounts."

The brethren dine together in hall on the occasion of the

annual election of officers, and, judging from the sums voted, they must have fared tolerably.

An alarming coincidence obliges the summoning of a special court to decide on a circumstance without precedent, viz., that the annual feast-day happens on a day that is not a "flesh-day."

A feast without a fat buck and a flask of Gascon wine is not to be thought of, so another day is selected for the dining, whilst the election takes place as usual.

Almost every court is occupied with cases in controversy between merchants and traders, which the company settle, and, doubtless, prevent much litigation and the bad feeling it engenders. They travel a little out of their line perhaps when a matter is moved "touching a stipend to be paid to a Preacher for to construe the youth of this Citie as well their Catechism as also their dutie and obedience towards God and their parents." Nevertheless, divers brethren subscribe to so laudable an object. Subsequently it is arranged that the company shall give £10 a year to Mr. Snapes, the chamber adding £50 for his salary as preacher.

The exchequer of the company is liberally furnished by the fines of £10, and the court fees levied on the entrance of new members (after the first three years from the date of the Charter), by the numerous fines inflicted for offences, half of which go to the city chamber, and half to the company; and they also take toll of the averages made by the company—for every tun of wines or other wares, i^d, and for every fardell of white clothe, i^d.

The company assume the power to confer monopolies; for we find that right to import linen cloth of less width than three-quarters of a yard and a half is granted exclusively to such merchants as have heretofore freighted the "Jonas" and the "Primrose" and none other, under penalty of x^s for every yard so imported.

The brethren evidently think something of themselves, and of their weight, and influence, and so it is considered good and convenient that one of the company on every day of the week, except Sunday and Friday, should repair to the yarn market to "commen and talk," about exchange and merchandize.

I fancy the tuckers and weavers would have something to say to this. Possibly they objected. Anyhow the "acte" is "abrogated," as it is termed, before carried into effect.

However important the compayne may be, they are subject to the mayor, and, in common with the other guilds, bound to attend him on all occasions whenever his worship shall so

desire. They are required yearly to furnish so many men to the Queen's Watch on Midsummer Eve; assembling with armor, harness, and furniture, to be received at one time at the Bishop's palace at 8 o'clock of the same eve, at another at my lord of Bedforde's place by 4 o'clock in the afternoon, under a penalty of 6s. 8d. per head.

The mayor serves the company on important occasions with a precept. On the 18th July, 1577, one is sent touching the Queen's proclamation for the reformation of apparel, as follows :

"At this Courte the Governor according to the Maior's precept called before him his whole compayne and gave them strayte chardge and coinnandement furthwithe to reforme them selves in their apparell according to the Queen's lawes and proclamations in that case late made and provided and to cause all suche as they have the charge and government of to doo the like. And further willed and required them to kepe them selves oute of Daunger of the saide statute and to use them selves in such decent order in their saide apparell as they be not founde hereafter contemptious or obstinate in that behalfe. But that they doo their obedient service to the good example of others."

The ill blood which existed between this country and Spain is shown in numerous minutes of grievances, both before and after the defeat of the Armada.

15th March, 1572.—An order is read from the mayor that an account shall be sent to the Commissioners sitting at Guildhall in London of all goods, debts, shipping, or money, arrested in any of the King of Spain's dominions, that restitution may be made of the same ; and in 1587 a committee sits daily in the Merchants' Hall to receive complaints from all the country round, that the already heavy reckoning against Spain might be further added to. At the Court held 16th December of the same year, a letter was read from the president of the Merchant Adventurers (London), trading to Spain and Portugal, inviting an account of all losses sustained at the hands of the Spaniards and "Portingales," as well as what injuries and wrongs they have suffered "by the Holy Howst," as they term it. The result of the communication is shown at the next Court, when (25th Dec., 1587) "there were divers lres returned from Totnes Dartmouth Lyme Charde Taunton and Tiverton together with sundrie noates from other places within this division of their severall losses and injuries sustained by King of Spaine and his subiects. Whereupon the whole companie do agree that Mr

Thomas Spicer, Mr Sampforde Mr Dorchester and Mr Jasper Horsey shall forthwith drawe upp a breyfe noate of all such lossess and injuries as everye the merchauntes within this division have sustained by the Kinge of Spaine and his subjectes and certifie the same accordingly. Together with a letter to Mr Milforde President according to the premisses. Which letters and noates were delivered to Mr Samporde by Mr Governor in open coarte."

The menaces of Spain and the preparations for the destruction of this country do not appear to have had much effect on the spirits of our merchants. Just six months before the great invasion they are discussing with eager interest a new adventure, of great magnitude in those days, to China and Cathay with Mr. Adrian Gilbert, brother of Sir Humphrey.

16th Dec., 1587.—“At the same courte there was made a coppie of certaine articles under divers of the companies hands, concerning a new adventure with Mr Adrian Gilbte (Gilbert) and Mr John Davies to China and Cathay where-upon Mr Governor did move the whole compayne what they intended to do therein and praied their resolute answere, who agreed that Mr Nicholas Martyn, Mr Nicholas Spicer, Mr Sampforde Mr Harkwell and Mr Jasper Horsey shall consider of all the accomptes of the voyage heretofore made by the said Adrian Gilbert and John Davies: and shall also set down what they think fit to be answered to the said articles with as much speede as conveniently they maie.”

The committee bring up their report at the next court, with a letter from Mr. Customer Smyth (*i.e.*, of the Customs), and an order is made to receive the names of volunteers for the voyage.

There is a curious and somewhat mysterious minute dated 13th June, 1588, when

“Mr John Periam Mayor and Governor of this Company of Merchants assembled the said Companie and proposed unto them a letter articles and instrument receaved from Mr Sanderson concerning a further proceeding to the North West Discovery. The articles now dated at Mr Customer Smythe’s house the 18th day of March last and the said instrument was dated the 2nd daie of Aprill in the xxxth year of Her Majestie’s raigne and tended to this purpose. That all the Companie of the said North West Discovery should put their handes and seales to the said Instrument constitutinge and ordynninge thereby eight persons viz;—Sir Francis Walsingham Sir Walter Rawleigh Mr Thomas Smith William Sanderson John Archer John Walter of London John Peryam of Exeter

and Walter Buggins of Tottenes and any sixt five or fower of them whereof the saide Sir Francis to be and to enacte make lawes orders and constitutions for the orderinge and further proceedings of the said voyage as also to call to accompte anie of the Companie for anie matters concerninge the same and further to do and performe in all things as much as the said Companye mought or now maie do. Upon the readings of the Articles and Instrument the most parte of the said Companie residunt here in Exeter there and then answered that they nor anie of them woulde consent therunto nor put their handes and seales to the said instrument for divers and sundrie speciaall causes then alleaged."

This was immediately after the return of Raleigh's relief expedition to Virginia with Sir Rd. Grenville, when one of his vessels was pillaged, and he was obliged to give up the venture. What the special causes were which decided the merchants to have nothing to do with the proposal we have no means of knowing; but not long afterwards Raleigh entered into an agreement with a company of London merchants, conceding his rights in respect of adventures and discoveries upon receiving one-fifth of the profits. Who shall say what Exeter might have gained had the merchants been more agreeable?

About the year 1578 the merchants were much troubled with rovers and pirates who infested the coasts of Devon and Cornwall, and inflicted much damage upon the shipping. A royal commission is granted to the company to fit out such shipping "as need shall require for the apprehension of pirates on the coast," and raters are at once appointed to obtain £100 from the merchants of the city towards the charge of one of the Quene's shippes." One-half of the £100 is sent to the Earl of Bedford.

The continued complaints of the merchants concerning the injuries and wrongs done by the Dunkerks and Spaniards subsequent to the invasion, resulted at last in permission from the Crown to fit out ten or twelve privateers for the protection of trade; they are privileged to take prizes free of the royal custom (city archives).

The company are, of course, consulted by the Government in matters which nearly concern them, viz., the French import duties. At the Court held 25th August, 1572, there was read a letter from the Lord High Commissioners touching certain duties levied at the port of St. Mallowes and other places in Britaine. The letter is addressed to the governor and consultes by name, and to certain merchants of Totnes, com-

manding the "skilfullest" among them to repair together and consider the "newe exactions and other things onerous to the marchaunte." The letter is dated the 9th of the month, but does not arrive till the 25th, and a copy is sent on to the "Maior" of Totnes, asking him to appoint one most "meetest" to ride to London with an answer, and the Court would appoint another, and be ready by the end of the week.

The expenses are met by a call upon the members in various sums of 2s. 6d. downwards.

The company have much to say, too, touching the English custom-house and the duties levied. They object frequently, and usually obtain some redress. On one occasion an imposition of 10s. a tonne on Gascon wines is compounded for by a payment down of £150, through the agency of one Mr. Mainwaring. Early in the next reign they refuse point blank to pay certain duties demanded by the custom-house officers, and petition the King to relieve them of these exactions. The King commissions the mayor, Sir John Acland, and others, to enquire touching the complaints; but with consummate craft, in the mean time (pretending profound ignorance of the existence of the company), the following gentle pressure is brought to bear:—"28 April 1609. The Earl of Salisbury to the Mayor of Exeter—He wishes it to be known the King desires to establish a Company of Merchants to trade to France."

We find in this year a precedent for admitting indirect claims:—"Mr Governor did move the whole Companie touchinge a some of money to be collected amongst us towards the procuringe of a clere discharge from the Kinge of Fraunce, as well that noe letters of mark should be from henceforth granted by the said Kinge againte our English Marchauntes." Mr. Hewlande, of Totnes, offers to "obteyne the saide discharge" for £300.

The spirit of adventure does not appear to be confined to legitimate trading; for at the court held on 9th September, 1568, it was agreed to take shares or lottes in the "Allottarie," and 64 members subscribed for 96 shares, "to be divided into three several posies," to be written in the name of the company, and any advantage gained to be divided proportionately amongst the subscribers.

Nicholas Martyn, John Livermore, and Richarde Swete, are appointed to carry out the arrangements, and they bind themselves, their heirs and assigns, to faithfully perform their duties. They chose respectively 32 numbers, running consecutively from 176916 to 177011.

The “posie” or motto of Nicholas Martyn savours of a spirit of pious faith :

“ Cast the grappell over the boate
If God will for the greate lotte.”

That of John Livermore betokens somewhat of a hopeful turn of mind, and the absence of any pious aspiration, coupled with the fact that he was twice fined “for that he did spake onseemlie and unhonest wordes,” may justify the inference that he was rather a loose fish.

His motto is—

“ The vaysell standing upon the whaves of the see
We truse shall carrye some lottes awaye.”

Richard Swete is evidently not a lucky man, but he knows how to take care of what he gets. His motto is—

“ If God doo sende any good fortune at laste
The lyons pawe will holde it faste.”

In all three posies there is allusion to the arms of the company, which were “A castell standinge in the pointe wave ij crownes in Cheiff gold upon the helone on a torse gold and azure, A lyons paw gulz holding a grappell golde the cordes gulz mantelyd gulz Dobled argent, Supportyd by a Dolphyn argent fynned tosked and wated golde and a Porkpyge gold pened sable.” These were the arms granted in the second of Elizabeth’s reign. All the works on Exeter, following Hoker, describe the less elaborate arms which were granted in Mary’s reign. There is much that is curious and deeply interesting in this volume of the merchants’ company; but the limits of this paper will not allow of any further extracts. I must, however, quote an inventory of the chattels of the company, which Mr Treasurer has charge of.

“ Imprimis. An ansyne of grene sylke sarcenet with the Armes of the Companye on it. One other ansine of blewe and yellow sylke sarcenet with sylke fringe.

“ Item. One other ansine of redd and grene sylke sarcenet without frenge.

“ Item. A scarf of blewe and yellow sylke sarcenet with sylke frenge.

“ Item. A scarf of redd and grene sarcenet without frenge.

“ Item. A scarf of blewe sarcenet.

“ Item. A Dromme which doth remayne in ye Halle.

“ Item. A Table borde and a Carpet and half a dozen of grene cussinghes.

“ Item. The celings and bynches of waynescote and tenne

the glasse wyndows 2 Cardes and a table of the Marchauntes Armes."

Hoker, in his *List of Guilds*, says :—

"The sixth fellowship is of the Tuckers and Weavers which is a very Ancient Company granted in the xviiith year of King Edward IVth but allowed under the hands of one Humphrey Brown one of the Justices of Assize on vith August 1558. Phillip and Mary."

In a minute book commencing 12th August, 1565, we find "an order for the collection of the Companye of Weavers Tuckers and Sheremen as followeth." Nicholas Harrys is the first name on the list, the sum of viii^d being placed against it. Seventy-six names follow, against four only of which the sum of iii^d is recorded, the others being apparently exempt. There are crosses, one, two and three, opposite most of the names; the meaning of which was perhaps known only to the gentleman who writes at the foot "By me William Dodridge." Nothing is recorded but the names of persons for several pages, the first minute appearing at a meeting held jiiith October, Anno Eliz xij^o (1570), and records that "Thomas Reynolde confessed that George Sampforde did call Godfery Voysey tricksey knave and haggling knave and that he wyll prove him to be a cheat. These wordes he spake the Sunday before Allhallow's day in open street directly before the same Voysey's dore in the presence of divers persons; and further that on Allhallow's Eve he said that the said Voysey then had stolen a remlet of clothe for a capp." For this offence George Sampforde had to pay 1s.

Among the city archives is an original document granting certain acts, orders, and ordinances to the weavers, tuckers, and shermen, "by the advice and consent of the Mayor Bailiffs and Commonalty of the said City and examined ratified approved confirmed and allowed by Sir Wm Perriam knt. Lord Chief Baron of H.M. Court of Exchequer and by Edward Truman one of the Justices of Her Highnesses Bench and Justices of Assize within the said City and County of Exon 13th day of August in the 44th year of the reign of Elizabeth."

There is another document without date, but which Mr. Stuart Moore fixes with the same year, viz., 1602, wherein the company "mekely desyryng and besechyng" the chamber to confirm certain ordinances, also ask that they may annually use the "Chapel of the Assumption of our Blessed Lady" (the hall still used by the society), for the election of their master and wardens. They also pray *inter alia* for power to

fine a craftsman 6s. 8d., who should wear the livery of any lord or gentleman.

I imagine this letter to have been the original petition from the company to the chamber for a grant; but that some doubt existing as to the powers of the chamber, a new form was necessary before they could go to the judges of assize for approval.

That there should be no mistake about it, the next time the company wanted a charter they went direct to the crown, and on 20th July, 1619, King James signed a Charter, granting to the society ample and almost despotic powers within their community. On the 3rd day of August, 1619, this charter was publicly read in the common hall of the company, in the presence of certain dignitaries, and the master, wardens, and officers, were duly sworn in. This ceremony has been continued annually in the same hall, and in the same month, to the present day.

Under the old grants the company appeared to exercise considerable power. No one was admitted who had not served seven years' apprenticeship with a member of the Guild under a fine of £10; and no person could be a member unless a freeman of the city, or some other similar corporate city.

They fixed the price for dressing coloured kerseys at xxii^d, and for making the same xxii^d, and for every serge or kersey brought from Tiverton, or elsewhere, to be dressed, the charge was viii^d.

They inflicted fines for non-attendance—for “working clothe in rack” in Northenhay contrary to the order of the house, not being free of the company, 6s. 8d.; for infringing statute for reformation of dozens, 6s. 8d. (the offence is explained in a note—“he worked a dozen with hard handells”); for working with a certain kind of card contrary to orders, for mentioning “the Crafte and Mystery of Weavinge contrary to the order of the house xx^s, and refusing to paye the fyne he was thereupon commited to prison until the same be paid.” Breaches of etiquette at the annual dinner were also punishable with a fine. Richard Mason so suffered “in that he refused or made question to drink after the said Master,” and were the potations so deep that no “Strangers nor anie Children should be brought or tollerated at the Master’s dynner?”

There appears to have been some effort made about 1610 to get a new charter, a sum of £20 having been collected for the purpose, and Mr. James Samford “is entreated and hath consented to ride to London about the procuring of the said

act, and whatsoever charge shall be necessary to be laid out for prosecutinge of this busynes shall be paid unto him with all convenient spedē." There is no further mention of this "busynes," which was probably a failure.

Upon the Charter of James, the fines become more numerous, and the regulations more rigid. There are constantly fines recorded for "milling," for "hanging of clothe," &c., on the "Sabaothe" day after v of the clock; and "for setting a Tucking Mill going the Sunday after Ascencion day last before 8 of the Clock in the Evening, 3s. 4d." For ill-dressing ell brodes, and for ill-burling serges, various sums; for prosecuting suits without leave, and for abusive language. Mr. Wm. Combe, to wit, in Public Hall, "made these words unto Mr Roberts that he was an unworthie fellow and that he was better to be a dogg whipper than a Master," for which he had to pay 2s. 6d.

Thomas Dagworthie reported the same.

Mr. Coombe, as saying that he would pay no fyne because they shall not have money to buy wine; and added moreover that he cared not a (fig) for this company—fine increased to 6s. 8d. Again, the same incorrigible, for "reportinge" that the masters of the company "did bibbe out the fines in wine," is fined 2s. 6d., which at first he refused to pay, but afterwards relented, and, it is to be hoped, became penitent. There may possibly be some grounds for Mr. Coombe's insinuations; for I find in the minute book sundry exceptional votes for excess of expenditure in the annual feasts. At one time £6 10s. is paid to the warden "for his halfe of the dyner." Portions of fines are devoted occasionally to the same purpose; and later on, the warden, in consideration that the company is far more numerous than formerly, the sum of £20 is voted towards the feast. Mr. Thomas Wylie, Fuller, also gives evidence in these scandalous words, for which he is presented "that there are not above 6 Master Tuckers in Towne but are rogues knaves or drunkards." A climax seems to be reached in the entry "Common plate of y^e Company to be sold for reimbursing the Warden." Fines for making suit in law without leave, for employing foreigners, for revealing the secrets of the craft, for lending tools to the uninitiated and showing their use, for breaking silence in hall, and for irreverent behaviour, are common. Leave is given to sundry persons to enter "plaintes" either against either, and "Mr Wm Morrell may enter Suit against Thomas Bicknell if his pigge do come into the Shillhay after Saturday next."

The fines are enforced by distress warrant, and in more than one case the tucker's shears are "distrained of" and sold.

The middle of the 17th century appears to have been a period of great activity and prosperity in the woollen and serge trade of the city. The merchants had left far behind their former rivals, the Crediton men, and Exeter was the great emporium of the trade. In 1660 the company petition the mayor and chamber, "that the streets leading to their Market place in Southgate St. may be chained up from 8 to 4 on Market days because they are disturbed by reason of the great concourse of carriages and hackney horses." Towards the end of the century they are troubled with encroachments on their monopoly. A presentation to Parliament is made against a certain Hamburgh company, and prosecutions are directed "against the transporters of wool either from Ireland or England to foreyne parts." "Their manufacture of the new Drapy is much decayed by reason of the increase of the said manufacture in Ireland and the transportation of English and Irish wool contrary to law," and certain members of the company are ordered to prepare "reasons or expedients" to be offered to y^e Parliament to prevent the said mischief.

A petition against the African Company is to be exhibited to the Parliament "that the trade may be free and not confined as it hath been to the great damage of y^e King and Kingdome," and applications made to Parliament to procure a "particular Act for making the port of Exon a free port for importation of prize wool," are instances of the efforts made to maintain and protect the important trade.

The Society of Merchant Adventurers did not survive the Revolution; but the guilds of the "taylors," and the weavers, tuckers, and shermen, exercised their functions for nearly four hundred years; and if their principles do not accord with modern ideas, there must have been much that was good in them to be endowed with such vitality. Many of our elderly citizens remember the guilds, preceded by their respective beadle, with mace and cocked hat, and every member in his gown, on certain saints' days and holydays, "bringing the Mayor to St. Peter's," as it was termed, marching in front of the corporation to the Cathedral service. The Taylors' Company has not been defunct more than a quarter of a century. The hall was in Gandy Street, close to New Buildings, and the arms of the guild are still to be seen. The last property owned by the society was the spot of land

on which the Heavitree Gallows stood, and which was sold some twenty or thirty years since.

The weavers, tuckers, and shermen, still exist, and meet annually in their hall on Fore Street Hill, which the guild first began to use, by permission of the chamber, in 1602, it being then a disused chapel, dedicated to "St. Mary of the Assumption."

The escutcheon of the guild, with the motto, "Labor labori laborem addit," continues on the gate. The beadle and his mace are still an institution; and he has even condescended to show himself in full costume on the occasion of some public ceremony within the last few years. The craftsmen still elect their master and wardens with all due formality every year; but the glory and utility of the guild are alike departed, and its functions now are limited to the distribution of certain charities.

General Statistics of ~~W~~ ding

		1871	Averages.
1 Total fall, in inches	. . . . .	36.72	36.28
2 Total gallons per acre	. . . . .	830,700	820,746
3 Total tons per acre	. . . . .	3,719	3,675
4 Total <i>relative</i> fall	. . . . .	1,012	1,000
5 Actual number of wet days	. . . . .	179	176
6 <i>Relative</i> number of wet days	. . . . .	102	100
7 Average wet-day fall, in inches	. . . . .	.21	.21
8 Number of days of excessive fall	. . . . .	64	59
9 Number of days of defective fall	. . . . .	113	115
10 Number of days of average fall	. . . . .	2	2
11 Greatest fall in twenty-four hours, in	8	1.39	1.51
12 Relation to annual fall (= 1000)	. . . . .	38	42
13 Date of greatest fall	. . . . .	Sept. 25	...
14 Greatest number of consecutive dry	. . . . .	22	22
15 Date of ditto	. . . . .	May 1 to 82	...
16 Greatest number of consecutive wet	. . . . .	12	16
17 Date of ditto	. . . . .	Sept. 25 to Oct. 6	...
18 Number of rainless intervals of a week	5	9	8
19 Month of greatest fall	. . . . .	Sept.	...
20 Its fall, in inches	. . . . .	7.10	6.85
21 Relation to annual fall (= 1000)	. . . . .	193	189
22 Three wettest consecutive months	. . . . .	Sept., Oct., Nov.	...
23 Their total fall, in inches	. . . . .	12.89	13.51
24 Relation to annual fall (= 1000)	. . . . .	351	372
25 Month of greatest number of wet days	. . . . .	July	...
26 Its number of	ditto	21	24
27 Relation to annual number (= 1000)	. . . . .	117	135
28 Month of least fall	. . . . .	May	...
29 Its fall, in inches	. . . . .	.34	.43
30 Relation to annual fall (= 1000)	. . . . .	9	12
31 Three driest consecutive months	. . . . .	March, April, May	...
32 Their total fall, in inches	. . . . .	6.95	4.22
33 Relation to annual fall (= 1000)	. . . . .	189	116
34 Month of least number of wet days	. . . . .	May	...
35 Its number of	ditto	5	5
36 Relation to annual number (= 1000)	. . . . .	28	29

THE RAINFALL ON THE ST. MARY CHURCH ROAD,
TORQUAY, DURING THE EIGHT YEARS ENDING
WITH DECEMBER 31ST, 1871.

BY W. PENGELLY, F.R.S., F.G.S.

(Read at Exeter, July, 1872.)

THE data employed in this communication, were obtained under precisely the same conditions as those made use of in previous papers under corresponding titles.* I use one of Mr. Casella's British Association five-inch gauges, which is placed with its top nine inches above the ground, near the middle of a small almost level lawn, 200 feet above the sea, one mile north of Torbay, three-quarters of a mile from the summit of Warberry Hill, which rises to the height of 450 feet between it and Babbacombe Bay on the N.E.; and the centre of Dartmoor is nineteen miles from it, in a W.N.W. direction. The gauge is examined daily at 9 A.M., and such rain as it contains is registered under date of the previous day.

Table I. is devoted to the general Rainfall statistics at the station.

TABLE II.

Showing the actual and average Rainfall, in inches, on St. Mary Church Road, Torquay, for every month during the eight years ending December 31, 1871:—

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Jan.	2.76	5.98	6.58	6.00	4.95	5.90	2.36	3.48	4.75
Feb.	2.38	4.44	4.67	3.06	1.96	3.89	3.33	2.45	3.27
Mar.	3.20	2.05	3.29	6.99	2.23	2.08	3.69	1.81	3.17
Apl.	1.23	0.81	2.39	2.90	2.78	0.83	0.45	4.80	2.02
May	1.60	4.14	2.43	5.42	1.72	6.52	1.71	0.34	2.98
June	1.36	3.06	0.95	0.88	0.33	0.58	0.18	2.18	1.19
July	0.49	2.21	1.54	5.45	0.28	0.39	0.93	4.28	1.95
Aug.	0.83	4.49	2.11	1.74	3.87	0.33	0.95	1.11	1.93
Sep.	1.98	0.00	8.89	2.80	5.52	4.92	1.27	7.10	4.06
Oct.	1.68	8.62	3.24	3.13	2.41	2.58	4.02	4.48	3.77
Nov.	3.79	5.58	1.63	1.39	4.24	1.79	2.87	1.31	2.82
Dec.	3.53	4.49	2.97	2.35	8.90	6.02	3.24	3.38	4.36
Totls.	24.83	45.87	40.69	42.11	39.19	35.83	25.00	36.72	36.28

* See "Trans. Devon. Assoc.," vols. iii. and iv., 1869, 1870, and 1871.

In order to show the relation of the average rainfalls of the different months to one another, the figures in the right or "averages" column of Table II. were employed thus:—The greatest average monthly rainfall (that of January = 4·93 inches) was put = 1000, and the others equated to it. For example, the average rainfall of January : the average rainfall of February = 4·75 inches : 3·27 inches = 1000 : 688. In other words, for every 1000 units of rain in January during the eight years, there were 688 such units in February; and so on for the other months. The entire results thus obtained are arranged in descending order in the following table.

TABLE III.

Showing, *relatively*, the average Rainfall of each month during the eight years ending December 31st, 1871; the greatest *actual* monthly average (January) being put = 1000, and the others equated to it; the whole being arranged in descending order.

1 January	= 1000	7 May	= 627
2 December	= 918	8 November	= 594
3 September	= 855	9 April	= 425
4 October	= 794	10 July	= 411
5 February	= 688	11 August	= 406
6 March	= 667	12 June	= 251

On comparing the foregoing Table with the corresponding one for last year, it will be found that January, December, and June are the only months occupying the same places in both.

In order to show the relative contribution of each month to the annual rainfall, the latter in each year was put = 1000 and the former equated to it. For example, in 1864, the annual rainfall : the January rainfall = 24·83 inches : 2·76 inches = 1000 : 111; hence, if the total rainfall of 1864 had been divided into 1000 equal parts, 111 of those parts fell in January; and so on for the other months in each of the eight years.

The results thus obtained are shown in the following Table.

TABLE IV.

Showing, *relatively*, the Rainfall of each month as compared with the total fall of the year to which it belonged; the latter being put, in each case, = 1000, and the former equated to it.

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Jan.	111	130	162	142	126	165	94	95	131
Feb.	96	96	115	73	50	109	133	67	90
Mar.	129	45	81	166	57	58	148	49	87
Apl.	50	11	59	69	71	23	18	131	56
May	64	90	60	129	44	182	68	9	82
June	55	67	23	16	8	16	7	59	33
July	20	48	38	129	7	11	37	117	54
Aug.	33	98	52	41	99	9	38	30	53
Sept.	80	0	218	66	141	137	51	193	112
Oct.	68	188	80	74	61	72	161	122	104
Nov.	153	121	40	33	108	50	115	36	78
Dec.	142	98	73	55	227	168	129	92	120
Totls.	1000	1000	1000	1000	1000	1000	1000	1000	1000

The foregoing Table shows that the greatest January relative contribution to the year's rainfall was that of 1869, and the least that of 1870—the former being 165 thousandths and the latter 94. Hence the Range of Fluctuation was 71 (= 165–94) thousandths.

The Ranges of Fluctuation for the different months are given, in ascending order, in the next Table.

TABLE V.

Showing, *relatively*, the Range of Fluctuation of each month during the eight years in its contribution to the total Rainfall of each year respectively :—

1	June	= 60	7	March	= 121
2	January	= 71	8	July	= 122
3	February	= 83	9	October	= 127
4	August	= 90	10	December	= 172
5	{ April	= 120	11	May	= 173
	{ November	= 120	12	September	= 218

A comparison of the foregoing Table with the corresponding one for 1869, shows that April and May have changed their places, but that in all other respects the two Tables are identical.

In order to show the ratio of the rainfall of a given month in a given year to the average fall of the same month during the eight years, the latter was put = 1000 and the former equated to it. For example, from Table II., the January fall in 1865 : to the average January fall = 2·76 inches : 4·75

= 581 : 1000. In other words, the January fall in 1864 was but little more than half the average fall of the month.

The results thus obtained for each month, in each year, are given in the succeeding Table.

TABLE VI.

Showing, *relatively*, the Rainfall of each month during the eight years, as compared with the average of the same month for the entire period; the latter being put = 1000, and the former equated to it.

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Jan.	581	1259	1385	1263	1042	1242	497	733	1000
Feb.	728	1358	1428	936	599	1189	1018	749	1000
Mar.	1009	647	1038	2205	703	656	1164	571	1000
Apr.	609	401	1183	1436	1376	411	223	238	1000
May	537	1389	815	1819	577	2188	574	114	1000
June	1143	2571	798	739	277	487	151	1832	1000
July	251	1133	790	2794	144	200	477	2195	1000
Aug.	430	2326	1093	902	2005	171	492	575	1000
Sep.	488	0	2190	690	1360	1213	313	1749	1000
Oct.	446	2286	859	830	639	684	1066	1188	1000
Nov.	1344	1979	578	493	1504	635	1018	465	1000
Dec.	810	1030	681	539	2041	1381	743	775	1000

As might have been expected, Table II. shows that the maximum and minimum actual falls of one month by no means occur in the same years as those of another month. Thus the maximum and minimum of January were in 1866 and 1870 respectively, while those of December were respectively in 1868 and 1867.

The following Table shows the years of maximum and minimum for each of the twelve months during the eight years.

TABLE VII.

Showing the years in which the actual Rainfall of each month was a maximum and a minimum.

	Max.	Min.		Max.	Min.
January . . .	1866	1870	July . . .	1867	1868
February . . .	1866	1868	August . . .	1865	1869
March . . .	1867	1871	September . . .	1866	1865
April . . .	1867	1870	October . . .	1865	1864
May . . .	1869	1871	November . . .	1865	1871
June . . .	1865	1870	December . . .	1868	1867

The next Table is simply the reverse of the foregoing. It shows the months which in each year received their maximum and minimum falls.

TABLE VIII.

Showing the months which in each year received their maximum and minimum actual Rainfalls.

	Maximum.	Minimum.
1864	None.	October.
1865	June, August, October, November.	September.
1866	January, February, September.	None.
1867	March, April, July.	December.
1868	December.	February, July.
1869	May.	August.
1870	None.	January, April, June.
1871	None.	March, May, Novr.

The following Table, compiled from IV., shows the year in which each month's contribution to the total annual Rainfall was greatest and least; in other words, when each month was *relatively*, not *actually*, wettest and when driest.

TABLE IX.

Showing the years in which the Rainfall of each month was a maximum and a minimum in relation to the total Rainfalls of the years respectively.

	Max.	Min.		Max.	Min.
January . . .	1869	1870	July . . .	1867	1868
February . . .	1870	1868	August . . .	1868	1869
March . . .	1867	1865	September . .	1866	1865
April . . .	1871	1865	October . . .	1865	1868
May . . .	1869	1871	November . .	1864	1867
June . . .	1865	1870	December . .	1868	1867

The next Table bears the same relation to the immediately preceding one, that VIII. bears to VII.; and shows the months which, in each year, furnished their maximum and minimum contributions to the total rainfall of the year.

TABLE X.

Showing the months which in each year received the maximum and minimum Rainfalls in relation to the total Rainfalls of the years respectively.

	Max.	Min.
1864	November.	None.
1865	June, October.	March, April, September.
1866	September.	None.
1867	March, July.	November, December.
1868	August, December.	February, July, October.
1869	January, May.	August.
1870	February.	January, June.
1871	April.	May.

TABLE XI.

In which, in each year, the months are arranged, in descending order according to their *actual* Rainfalls.

1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Nov.	Oct.	Sept.	March	Dec.	May	Oct.	Sept.	Jan.
Dec.	Jan.	Jan.	Jan.	Sept.	Dec.	Mar.	April	Dec.
Mar.	Nov.	Feb.	May	Jan.	Jan.	Feb.	Oct.	Sept.
Jan.	Aug.	March	July	Nov.	Sept.	Dec.	July	Oct.
Feb.	Dec.	Oct.	Oct.	Aug.	Feb.	Nov.	Jan.	Feb.
Sept.	Feb.	Dec.	Feb.	April	Oct.	Jan.	Dec.	Mar.
Oct.	May	May	April	Oct.	March	May	Feb.	May
May	June	April	Sept.	March	Nov.	Sept.	June	Nov.
June	July	Aug.	Dec.	Feb.	April	Aug.	Mar.	April
April	March	Nov.	Aug.	May	June	July	Nov.	July
Aug.	April	July	Nov.	June	July	Ap.	Aug.	Aug.
July.	Sept.	June	June	July	Aug.	June	May	June

The foregoing Table was, of course, compiled from Table II.

For the purpose of showing the order in which, during the eight years, a given month had a great or small actual rainfall the following Table was compiled from Table II. The years are in descending order from left to right. The minus sign (—) prefixed to a given year, denotes that in that year, and in all those on the right of it, the rainfall of the month was below

the average. For example, the rainfall of January during the eight years was greatest in 1866, after which that of 1867 was greatest, then 1865, 1869, 1868, 1871, 1864, and then 1870—the driest January of the eight. Also that in 1871, 1864, and 1870, the rainfall of the month was below its average, whilst in the other years it was above; and so on for the other months.

TABLE XII.

In which, for each month, the years are arranged, in descending order, according to the total monthly Rainfall.

January . .	1866	1867	1865	1869	1868	-1871	1864	1870
February . .	1866	1865	1869	1870	-1867	1871	1864	1868
March . .	1867	1870	1866	1864	-1868	1869	1865	1871
April . .	1871	1867	1868	1866	-1864	1869	1865	1870
May . .	1869	1867	1865	1866	-1868	1870	1864	1871
June . .	1865	1871	1864	-1866	1867	1869	1868	1870
July . .	1867	1871	1865	-1866	1870	1864	1869	1868
August . .	1865	1868	1866	-1867	1871	1870	1864	1869
September . .	1866	1871	1868	1869	-1867	1864	1870	1865
October . .	1865	1871	1870	-1866	1867	1869	1868	1864
November . .	1865	1868	1864	1870	-1869	1866	1867	1871
December . .	1868	1869	1865	-1864	1871	1870	1866	1867

TABLE XIII.

Showing in each year the actual total Rainfall, in inches, from the beginning of the year to the end of each month.

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Jan.	2'76	5'98	6'58	6'00	4'95	5'90	2'36	3'48	4'75
Feb.	5'14	10'42	11'25	9'06	6'91	9'79	5'69	5'93	8'02
Mar.	8'34	12'47	14'54	16'05	9'14	11'87	9'38	7'74	11'19
Apl.	9'57	13'28	16'93	18'95	11'92	12'70	9'83	12'54	13'21
May	11'17	17'42	19'36	24'37	13'64	19'22	11'54	12'88	16'20
June	12'53	20'48	20'31	25'25	13'97	19'80	11'72	15'06	17'39
July	13'02	22'69	21'85	30'70	14'25	20'19	12'65	19'34	19'34
Aug.	13'85	27'18	23'96	32'44	18'12	20'52	13'60	20'45	21'26
Sep.	15'83	27'18	32'85	35'24	23'64	25'44	14'87	27'55	25'32
Oct.	17'51	35'80	36'09	38'37	26'05	28'02	18'89	32'03	29'09
Nov.	21'30	41'38	37'72	39'76	30'29	29'81	21'76	33'34	31'92
Dec.	24'83	45'87	40'69	42'11	39'19	35'83	25'00	36'72	36'28

The next Table shows the *relative* progress of each year's rainfall (regarded as a constant quantity and = 1000), and was calculated from XIII. as III. was calculated from II.

TABLE XIV.

Showing, in each year, the total Rainfall from the beginning of the year to the end of each month in relation to the Annual Rainfall; the latter, in each case, being put = 1000, and the former equated to it.

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Jan.	111	130	162	142	126	165	94	95	131
Feb.	207	227	276	215	176	273	228	161	221
Mar.	336	272	357	381	233	331	375	211	308
April	385	290	416	450	304	354	393	342	364
May	450	380	476	579	348	536	462	351	447
June	504	446	499	600	356	553	469	410	479
July	524	495	537	729	364	563	506	527	533
Aug.	558	593	589	770	462	573	544	557	586
Sep.	633	593	807	837	6c3	710	595	750	698
Oct.	705	780	887	911	665	782	756	872	802
Nov.	852	902	927	944	773	832	870	908	880
Dec.	1000	1000	1000	1000	1000	1000	1000	1000	1000

The explanations which have been given of the thirteen Rainfall Tables (II. to XIV.) are so strictly applicable to those devoted to Wet days (XV. to XXVII.) and to Wet-day rates of Rain (XXVIII. to XXXVII.) as to render it unnecessary to repeat them.

TABLE XV.

Showing the actual and average number of Wet Days in each month during the eight years.

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Jan.	15	21	25	17	21	16	16	18	19
Feb.	17	22	21	19	12	20	15	20	18
Mar.	21	14	19	23	22	17	8	12	17
April	10	12	19	19	10	10	5	18	13
May	10	19	15	19	7	16	9	5	12.5
June	15	5	12	10	3	6	4	14	9
July	7	15	11	16	6	7	5	21	11
Aug.	8	17	17	11	15	7	7	11	12
Sep.	21	0	29	13	13	22	10	15	15
Oct.	10	20	12	26	19	17	18	20	18
Nov.	20	18	19	4	13	16	15	10	14
Dec.	14	17	19	13	30	20	13	15	18
Totals.	168	180	218	190	171	174	125	179	176

TABLE XVI.

Showing, *relatively*, the average number of Wet Days of each month during the eight years ending December 31st, 1871; the greatest actual monthly average (January) being put = 1000, and the others equated to it; the whole being arranged in descending order.

1	January	= 1000	7	November	= 737
2	{ February	= 947	8	April	= 684
	{ October	= 947	9	May	= 658
	{ December	= 947	10	August	= 632
5	March	= 895	11	July	= 579
6	September	= 789	12	June	= 474

TABLE XVII.

Showing, *relatively*, the number of Wet Days in each month during the eight years, as compared with the total number in the year to which it belonged, the latter being in each year put = 1000, and the former equated to it.

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Jan.	89	117	115	89	123	92	128	101	118
Feb.	101	122	96	100	70	115	120	112	102
Mar.	125	78	87	121	129	98	64	67	97
April	60	67	87	100	58	57	40	101	74
May	65	106	69	100	41	92	72	28	71
June	89	28	55	53	18	34	32	78	51
July	42	83	50	84	35	40	40	117	63
Aug.	48	94	78	58	88	40	56	61	68
Sept.	125	0	133	68	76	126	80	84	85
Oct.	60	111	55	137	111	98	144	112	102
Nov.	119	100	87	21	76	92	120	56	80
Dec.	77	94	87	68	175	115	104	84	102
Totls.	1000	1000	1000	1000	1000	1000	1000	1000	1000

TABLE XVIII.

Showing, *relatively*, the Range of Fluctuation of each month, during the eight years, in its contribution to the total number of wet days in each year respectively.

1	January	= 39	7	June	= 71
2	July	= 49	8	May	= 78
3	February	= 52	9	October	= 89
4	August	= 54	10	November	= 99
5	April	= 61	11	December	= 107
6	March	= 65	12	September	= 133

TABLE XIX.

Showing, *relatively*, the number of Wet Days in each month during each of the eight years, as compared with the average number in the same month for the entire period; the latter being put = 1000, and the former equated to it.

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Jan.	789	1105	1316	895	1105	842	842	947	1000
Feb.	944	1222	1167	1055	667	1111	833	1111	1000
Mar.	1235	823	1118	1353	1294	1000	471	706	1000
April	769	923	1462	1462	769	769	385	1385	1000
May	800	1520	1200	1520	560	1280	720	400	1000
June	1667	556	1333	1111	333	667	444	1556	1000
July	636	1364	1000	1455	545	636	455	1909	1000
Aug.	667	1417	1417	917	1250	583	583	917	1000
Sept.	1400	0	1933	867	867	1467	667	1000	1000
Oct.	556	1111	667	1444	1056	944	1000	1111	1000
Nov.	1428	1286	1357	286	929	1143	1071	714	1000
Dec.	778	944	1056	722	1667	1111	722	833	1000

TABLE XX.

Showing the years in which the actual number of Wet Days in each month was a maximum and a minimum.

	Max.	Min.		Max.	Min.
January . . .	1866	1864	July . . .	1871	1870
February . . .	1865	1868	August* . . .	1865-6	1869-70
March . . .	1867	1870	September . .	1866	1865
April* . . .	1866-7	1870	October . . .	1867	1864
May* . . .	1865-7	1871	November. . .	1864	1867
June . . .	1864	1868	December* . .	1868	1867-70

TABLE XXI.

Showing the months which in each year received their maximum and minimum actual number of Wet Days.

* April, May, August, and December, marked with asterisks, had each more than one maximum, or minimum, or both. Similar facts will be indicated in the same way in succeeding Tables.

	Max.	Min.
1864	June, November.	January, October.
1865	February, May,* August.*	September.
1866	January, April,* August,* September.	None.
1867	March, April,* May,* October	November, December.*
1868	December.	February, June.
1869	None.	August.*
1870	None.	March, April, July, August,* December.*
1871	July.	May.

TABLE XXII.

Showing the years in which the number of Wet Days in each month was a maximum and a minimum in relation to the total number of the year respectively.

	Max.	Min.		Max.	Min.
January*. . .	1870	1864-7	July . . .	1871	1868
February . . .	1865	1868	August . . .	1865	1869
March . . .	1868	1870	September . .	1866	1865
April . . .	1871	1870	October . . .	1870	1866
May . . .	1865	1868	November . .	1870	1867
June . . .	1864	1868	December . .	1868	1867

TABLE XXIII.

Showing the months which in each year received the maximum and minimum number of Wet Days in relation to the total number of the year respectively.

	Max.	Min.
1864	June.	January.*
1865	February, May, August.	September.
1866	September.	October.
1867	None.	January,* November, December.
1868	March, December.	February, May, June, July.
1869	None.	August.
1870	Jauuary, October, November.	March, April.
1871	April, July.	None.

TABLE XXIV.

In which, in each year, the months are arranged in descending order according to their actual numbers of Wet Days.

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Mar.)	Feb.	Sep.	Oct.	Dec.	Sep.	Oct.	July	Jan.	
Sep.)	Jan.	Jan.	Mar.	Mar.	Feb.	Jan.	Feb.	Feb.	
Nov.)	Oct.	Feb.	Feb.	Jan.	Dec.	Feb.	Oct.	Oct.	
Feb.)	May	Mar.	Apl.	Oct.	Mar.	Nov.	Jan.	Dec.	
Jan.)	Nov.	Apl.	May	Aug.	Oct.	Dec.	Apl.	Mar.	
June)	Aug.	Nov.	Jan.	Sep.	Jan.	Sep.	Sep.	Sep.	
Dec.)	Dec.	Dec.	July	Nov.	May	May	Dec.	Nov.	
Apl.)	July	Aug.	Sep.	Feb.	Nov.	Mar.	June	Apl.	
May)	Mar.	May	Dec.	Apl.	Apl.	Aug.	Mar.	May	
Oct.)	Apl.	June	Aug.	May	July	Apl.	Aug.	Aug.	
Aug.)	June	Oct.	June	July	Aug.	July	Nov.	July	
July	Sep.	July	Nov.	June	June.	June	May	June	

TABLE XXV.

In which, for each month, the years are arranged in descending order according to the total monthly number of Wet Days.

Jan.	1866	(1865	1868)	- 1871	1867	(1869	1870)	1864
Feb.	1865	1866	1869	1871	1867	- 1864	1870	1868
Mar.	1867	1868	1864	1866	1869	- 1865	1871	1870
Apl.	(1866	1867)	1871	- 1865	(1864	1868	1869)	1870
May	(1865	1867)	1869	1866	- 1864	1870	1868	1871
June	1864	1871	1866	1867	- 1869	1865	1870	1868
July	1871	1867	1865	1866	- (1864	1869)	1868	1870
Aug.	(1865	1866)	1868	- (1867	1871)	1864	(1869	1870)
Sep.	1866	1869	1864	1871	- (1867	1868)	1870	1865
Oct.	1867	(1865	1871)	1868	1870	- 1869	1866	1869
Nov.	1864	1866	1865	1869	1870	- 1868	1871	1867
Dec.	1868	1869	1866	- 1865	1871	1864	1867	1870

The January of 1865 had the same number of Wet Days as that of 1868, hence the two years are bracketed in the Table; and so on in similar cases.

TABLE XXVI.

Showing in each year the actual total number of Wet Days from the beginning of the year to end of each month.

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Jan.	15	21	25	17	21	16	16	18	19
Feb.	32	43	46	36	33	36	31	38	37
Mar.	53	57	65	59	55	53	39	50	54
Apl.	63	69	84	78	65	63	44	68	67
May	73	88	99	97	72	79	53	73	79
June	88	93	111	107	75	85	57	87	88
July	95	108	122	123	81	92	62	108	99
Aug.	103	125	139	134	96	99	69	119	110
Sep.	124	125	168	147	109	121	79	134	126
Oct.	134	145	180	173	128	138	97	154	144
Nov.	154	163	199	177	141	154	112	164	158
Dec.	168	180	218	190	171	174	125	179	176

TABLE XXVII.

Showing in each year the total number of Wet Days from the beginning of the year to the end of each month in relation to the annual number; the latter, in each case, being put = 1000, and the former equated to it.

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Jan.	89	117	115	89	122	92	128	101	108
Feb.	190	239	211	189	193	207	248	212	210
Mar.	315	317	298	311	321	305	312	279	307
Apl.	375	383	385	411	380	362	352	380	381
May	435	489	454	511	421	454	424	408	449
June	524	517	509	563	439	489	456	486	500
July	565	600	560	647	474	529	496	603	562
Aug.	613	694	638	705	562	569	552	664	625
Sep.	738	694	771	774	637	695	632	749	716
Oct.	798	806	825	911	749	793	776	860	818
Nov.	917	906	913	932	825	885	896	916	898
Dec.	1000	1000	1000	1000	1000	1000	1000	1000	1000

TABLE XXVIII.

Showing the average Wet-day rate of rain, in inches, for every month during each of the eight years ending with December 31st, 1870, as well as during the eight years as a whole.

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Jan.	'18	'28	'26	'35	'24	'37	'15	'19	'25
Feb.	'14	'20	'22	'16	'16	'19	'22	'12	'18
March	'15	'15	'17	'30	'10	'18	'46	'15	'19
April	'12	'07	'13	'15	'28	'08	'09	'27	'16
May	'15	'22	'16	'29	'25	'41	'19	'07	'23
June	'09	'61	'08	'09	'11	'10	'04	'16	'13
July	'07	'15	'14	'34	'05	'06	'19	'20	'18
Aug.	'10	'26	'12	'16	'26	'05	'14	'10	'16
Sept.	'09	'00	'34	'22	'42	'22	'13	'47	'27
Oct.	'17	'43	'27	'12	'13	'15	'22	'22	'21
Nov.	'19	'31	'09	'35	'33	'11	'18	'13	'20
Dec.	'27	'26	'16	'18	'30	'32	'25	'23	'24
Means	'15	'25	'19	'22	'23	'21	'20	'21	'21

TABLE XXIX.

Showing, *relatively*, the average Wet-day rate of rain of each month during the eight years as a whole; the greatest actual Monthly Wet-day average being put = 1000, and the others equated to it; the whole being arranged in descending order.

1	September	= 1000	7	March	= 704
2	January	= 926	8	{ February	= 667
3	December	= 889		{ July	= 667
4	May	= 852	10	{ April	= 593
5	October	= 778		{ August	= 593
6	November	= 741	12	June	= 481

TABLE XXX.

Showing, *relatively*, the average Wet-day rate of rain in each month, as compared with the Wet-day rate of the entire year to which it belonged; the latter being put, in each case, = 1000, and the former equated to it.

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Jan.	1200	1120	1368	1591	1043	1762	750	905	1190
Feb.	933	800	1158	727	696	965	1100	571	857
March	1000	600	895	1364	435	857	2300	714	905
April	800	280	684	682	1217	381	450	1286	762
May	1000	880	842	1318	1087	1952	950	333	1095
June	600	2440	421	409	478	476	200	762	619
July	467	600	737	1545	226	286	950	952	857
Aug.	667	1040	632	727	1130	238	700	476	762
Sept.	600	0	1789	1000	1826	1048	650	2238	1285
Oct.	1133	1720	1421	555	565	714	1100	1048	1000
Nov.	1267	1240	474	1591	1435	524	900	619	952
Dec.	1800	1040	842	818	1304	1524	1250	1095	1143
Means	1000	1000	1000	1000	1000	1000	1000	1000	1000

TABLE XXXI.

Showing, *relatively*, the Range of Fluctuation of each month, during the eight years, in its average Wet-day rate of rain.

1 February	= 587	7 October	= 1165
2 August	= 892	8 July	= 1319
3 December	= 982	9 May	= 1619
4 April	= 1006	10 March	= 1865
5 January	= 1012	11 September	= 2238
6 November	= 1121	12 June	= 2240

TABLE XXXII.

Showing, *relatively*, the average Wet-day rate of rain in each month during each of the eight years, as compared with the average Wet-day rate in the same month during the eight years taken as a whole; the latter being put = 1000, and the former equated to it.

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Jan.	720	1120	1040	1400	960	1480	600	760	1000
Feb.	778	1111	1222	889	889	1056	1222	667	1000
March	789	789	895	1579	526	947	2421	789	1000
April	750	437	812	937	1750	500	562	1687	1000
May	652	957	696	1696	1087	1783	826	304	1000
June	692	4692	615	692	846	769	308	1231	1000
July	389	833	778	1889	278	333	1056	1111	1000
Aug.	625	1625	750	1000	1625	312	875	625	1000
Sept.	333	0	1259	815	1556	815	481	1741	1000
Oct.	810	2048	1286	571	619	714	1048	1048	1000
Nov.	950	1550	450	1750	1650	550	900	650	1000
Dec.	1125	1083	666	750	1250	1333	1042	958	1000

TABLE XXXIII.

Showing the years in which the average Wet-day rate of rain in each month was a maximum and a minimum.

	Max.	Min.		Max.	Min.
January . .	1869	1870	July . .	1867	1868
February* . .	1866-70	1871	August* . .	1865-8	1869
March . .	1870	1868	September . .	1871	1865
April . .	1868	1865	October . .	1865	1867
May . .	1869	1871	November . .	1867	1866
June . .	1865	1870	December . .	1869	1866

TABLE XXXIV.

Showing the months which in each year received their maximum and minimum average Wet-day rates of rain.

	Maximum.	Minimum.
1864	None.	None.
1865	June, August,* October.	April, September.
1866	February.*	November, December.
1867	July, November.	October.
1868	April, August.*	March, July.
1869	January, May, December.	August.
1870	February,* March.	January, June.
1871	September.	February, May.

TABLE XXXV.

In which, in each year, the months are arranged, in descending order, according to their average Wet-day rates of rain.

1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Dec.	June	Sept.	Jan. } Sept.	May	March	Sep.	Sept.	
Nov.	Oct.	Oct.	Nov. }	Jan.	Dec.	Apl.	Jan.	
Jan.	Nov.	Jan.	July	Dec.	Dec.	Feb. }	Dec.	
Oct.	Jan.	Feb.	March	April	Sept.	Oct. }	Oct.	
Mar. }	Aug. }	March	May	Aug.	Feb.	May }	July	Oct.
May }	Dec. }	May }	Sept.	May	March	July }	Jan.	Nov.
Feb.	May	Dec. }	Dec.	Jan.	Oct.	Nov.	June	Mar.
Apl.	Feb.	July	Feb. }	Feb.	Nov.	Jan.	Mar.	Feb. }
Aug.	Mar. }	April	Aug. }	Oct.	June	Aug.	Nov.	July }
June }	July }	Aug.	April	June	April	Sept.	Feb.	Apl. }
Sep. }	April	Nov.	Oct.	March	July	April	Aug.	Aug. }
July	Sept.	June	June	July	Aug.	June	May	June

TABLE XXXVI.

In which, for each month, the years are arranged in descending order, according to their average Wet-day rate of rain.

Jan.	1869	1867	1865	1866	-1868	1871	1864	1870
Feb.	(1866	1870)	1865	1869	-(1867	1868)	1864	1871
Mar.	1870	1867	-1869	1866	(1864	1865	1871)	1868
Apl.	1868	1871	-1867	1866	1864	1870	1869	1865
May	1869	1867	1868	-1865	1870	1866	1864	1871
June	1865	1871	-1868	1869	(1864	1867)	1866	1870
July	1867	1871	1870	-1865	1866	1864	1869	1868
Aug.	(1865	1868)	1867	-1870	1866	(1864	1871)	1869
Sept.	1871	1868	1866	-(1867	1869)	1870	1864	1865
Oct.	1865	1866	(1870	1871)	-1864	1869	1868	1867
Nov.	1867	1868	1865	-1864	1870	1869	1871	1866
Dec.	1869	1868	1864	1865	1870	-1871	1867	1866

TABLE XXXVII.

Showing in each year the average Wet-day rate of rain from the beginning of the year to the end of each month.

	1864	1865	1866	1867	1868	1869	1870	1871	Averages.
Jan.	'18	'28	'26	'35	'24	'37	'15	'19	'25
Feb.	'16	'24	'24	'25	'21	'27	'18	'16	'22
Mar.	'16	'22	'22	'27	'17	'22	'24	'15	'21
Apl.	'15	'19	'20	'24	'18	'20	'22	'18	'20
May	'15	'20	'20	'25	'19	'24	'22	'18	'21
June	'14	'22	'18	'24	'19	'23	'21	'17	'20
July	'14	'21	'18	'25	'18	'22	'20	'18	'20
Aug.	'13	'22	'17	'24	'19	'21	'20	'17	'19
Sept.	'13	'22	'20	'24	'22	'21	'19	'21	'20
Oct.	'13	'25	'20	'22	'20	'20	'19	'21	'20
Nov.	'14	'25	'19	'22	'21	'19	'19	'20	'20
Dec.	'15	'25	'19	'22	'23	'21	'20	'21	'21

TABLE XXXVIII.

Showing the number of days in each year on which given rainfalls were measured.

	1864	1865	1866	1867	1868	1869	1870	1871	Avergs.
Days on which '01 in. fell	26	15	26	23	22	29	15	28	23
'02 "	18	15	17	17	12	18	14	11	15
'03 "	9	5	18	10	10	6	6	11	9
'04 "	7	10	7	11	7	5	6	6	7
'05 "	13	9	13	5	6	7	10	8	8
'06 "	8	10	7	4	3	4	7	7	6
'07 "	5	6	9	2	3	2	3	2	4
'08 "	10	5	4	3	1	3	2	6	4
'09 "	6	4	2	4	3	6	3	5	4
'10 "	4	1	6	6	7	4	2	4	4
'11 to '20 "	16	30	38	38	29	27	17	25	27
'21 to '30 "	17	13	29	20	24	15	14	21	19
'31 to '40 "	11	14	13	18	10	12	7	18	13
'41 to '50 "	10	12	8	7	11	8	5	8	9
'51 to '100 "	7	25	17	18	20	20	11	17	17
'101 to '150 "	1	4	4	1	2	3	2	2	2
'151 to '200 "	0	1	0	3	1	0	1	0	1
Above '200	0	1	0	0	0	0	0	0	0

TABLE XXXIX.

Showing the aggregate Rainfalls in inches on each day of each month during the eight years ending December 31st, 1871, taken as a whole.

Dates.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.48	1.70	2.00	.53	.33	2.26	.69	.20	.79	.98	.16	1.06
2	1.07	1.42	.43	.28	1.13	.61	.76	.22	1.74	.92	.47	1.48
3	.27	.65	1.06	.26	1.24	.03	.89	.15	.55	.10	...	.85
4	1.76	3.04	.78	.08	1.75	.69	.74	.05	1.23	.13	.13	1.22
5	1.87	.63	1.23	.42	.09	.19	1.13	.64	1.53	.22	.55	1.52
6	1.39	2.13	.49	.14	.54	.04	.51	1.32	1.11	.66	.13	1.59
7	1.31	1.59	1.73	.87	1.20	.11	.60	.21	.15	1.14	.04	1.33
8	1.03	1.24	.19	.59	2.35	.11	.06	.29	1.78	.70	.50	.48
9	.46	.94	1.49	.01	.65	...	.74	.63	1.50	.43	.02	.31
10	2.42	1.19	.38	.21	1.23	.02	.41	.08	.52	.68	.44	.48
11	.85	1.22	1.09	1.22	2.14	.39	.31	.36	1.22	.88	.33	2.45
12	1.66	.62	.60	.14	1.70	.14	.54	1.15	.79	.19	.43	.81
13	1.11	.12	1.97	.14	.48	.61	.30	1.13	.44	.01	.60	2.54
14	1.41	.60	.76	.93	.06	.23	.72	.74	1.27	1.40	.75	.85
15	1.51	.60	1.05	.56	.04	.11	.59	.33	.61	.96	.19	1.35
16	1.67	.84	1.04	.77	.47	.05	1.10	.34	1.13	1.08	.83	2.01
17	1.24	.28	.86	.37	.52	.62	.41	1.22	1.72	1.98	.66	.96
18	1.79	.42	.70	1.44	.16	.31	.29	1.26	1.24	1.34	.29	1.23
19	.94	.21	1.28	1.69	.12	.96	.01	.04	.38	1.05	1.66	1.18
20	.12	.57	.03	1.09	.67	.21	.10	.54	.48	.78	1.21	1.17
21	1.33	.02	.83	.59	.44	.38	.33	.62	.98	2.82	3.04	.74
22	1.54	.05	.31	.28	.40	.26	.35	1.52	.09	1.69	.93	.51
23	.76	.41	1.70	.51	.49	.01	.22	.26	1.48	.62	1.35	.37
24	1.59	.40	1.23	.12	.63	.10	.40	.20	.32	1.24	2.52	.13
25	.50	.59	.60	.45	1.40	...	.61	.29	2.02	.93	.93	.89
26	.80	2.48	.31	.43	1.24	.02	.84	.25	1.44	.50	.73	1.00
27	.24	.93	.43	.68	1.15	.03	.70	.62	1.68	.78	1.19	.90
28	1.18	.52	.30	.57	.66	.07	.59	.27	1.14	1.36	.78	1.75
29	1.08	.77	.15	.51	...	.70	.18	.01	2.24	1.63	.49	1.03
30	1.74	...	.05	.31	.39	.26	...	.25	.91	2.36	1.85	1.80
31	1.89	...	.27	...	.21	...	.45	.24	...	.60	...	.89
Totals	38.01	26.18	25.34	16.19	23.88	9.52	15.57	15.43	32.48	30.16	22.60	34.88

The following is a summary of the principal facts in the foregoing Tables :—

1. That with respect to rainfall, the eight years arrange themselves, in descending order, thus :—1865 (or wettest), '67, '66, '68, '71, '70, '69, and '64 (or driest).
2. That the greatest annual rainfall (that of 1865) amounted to 45.87 inches, and the least (that of 1864) to 24.82 inches.
3. That the average annual rainfall was 36.28 inches, which was exceeded in 1865, '67, 66, '68, and '71, but not reached in '69, '70, and '64.

4. That the rainfall in 1869 was but .45 inch below the average, and that of '70 but .17 inch above that of '64.
5. That with respect to the number of wet days, the years arrange themselves, in descending order, thus :—1866, '67, '65, '71, '69, '68, '64, and '70.
6. That the greatest annual number of wet days (that of '66) was 218, or three wet days for every two dry ones ; and the least (that of '70) was 125.
7. That the average annual number of wet days was 176, or very slightly less than half the year, which was exceeded in 1866, '67, '65, and '71, but not reached in '69, '68, '64, or '70.
8. That the number of wet days in 1869 was but 2 below the general average, but that of '70 was 51 below it, and as many as 43 below that of '64—the lowest number in any other year.
9. That with regard to the annual Wet-day rate of rain, the years arrange themselves, in descending order, thus :—1865, '68, '67, ('69, '71,) '70, '66, and '64.
10. That the greatest Wet-day rate (that of 1865) was .25 inch, and the least (that of '64) was .15 inch.
11. That the average Wet-day rate was .21 inch, which was exceeded in '65, '68, and '67; equalled in '69 and '71; but not reached in '70, '66, or '64.
12. That with respect to the greatest fall in 24 hours, the years arrange themselves, in descending order, thus :—1865, '70, '68, '67, '71, '69, '66, and '64.
13. That the maximum greatest fall in 24 hours in any year (that of 1865), was 2.13 inches, and the minimum (that of '64) was 1.15 inch.
14. That the average greatest fall in 24 hours, per year, was 1.51 inch, which was exceeded in 1865, '70, '68, and '67, but not reached in '71, '69, '66, or '64.
15. That the maximum greatest annual fall in 24 hours, occurred in the wettest of the eight years (1865), and the minimum in the driest year ('64); but that in the other years the order was by no means that of the annual rainfall.
16. That with respect to the ratio which the greatest fall in 24 hours, in each year, bore to the annual rainfall, the years arrange themselves, in descending order, thus :—1870, '64, '65, '68, '71, '67, '69, and '66.
17. That this ratio varied from 7.1 per cent. in 1870, to 2.9 per cent. in '66, and averaged 4.2 per cent.
18. That the greatest annual fall in 24 hours has occurred in January (twice), February, March, May, June, September, and November.

19. That with respect to the greatest number of consecutive dry days, *i.e.* days on which the rain, if any, has been less than .01 inch, the years arrange themselves, in descending order, thus:—1865, '68, '71, '70, '64, '69, '67, and '66.

20. That the maximum greatest annual number of consecutive dry days was 44, in 1865, the wettest of the eight years; and the minimum 11, in '66.

21. That the average annual greatest number of consecutive dry days was 22, which was exceeded in 1865 and '68; equalled in '71; but not reached in '70, '64, '69, '67, or '66.

22. That with respect to the greatest number of consecutive wet days per year, *i.e.* days on which, at least, .01 inch of rain fell, the years arrange themselves, in descending order, thus:—1866, '68, '69, '64, ('65, '71), '67, and '70.

23. That the maximum greatest annual number of consecutive wet days varied from 30, in 1866, to 10 in 1870, and averaged 17.

24. That with respect to the number of rainless periods of a week or more per year, the years arrange themselves, in descending order, thus:—1870, '71, ('64, '68), ('67, '69), '65, and '66.

25. That the annual number of rainless periods of a week or more varied from 15 in 1870 to 5 in '66, and averaged 8.

26. That with respect to the greatest monthly fall annually, the years arrange themselves, in descending order, thus:—1868, '66, '65, '71, '67, '69, '70, and '64.

27. That the annual greatest monthly fall varied from 8.90 inches, in December 1868, to 3.79 inches, in November 1864, and averaged 6.85 inches.

28. That the ratio of the greatest monthly fall in each year, to the annual rainfall, varied from 22.7 per cent. in 1868, to 15.3 per cent. in '64, and averaged 18.9 per cent.

29. That the three wettest consecutive months have, with the exception of 1871, been the first three, or the last three of the year—the former having been thus distinguished four times, and the latter three times. In 1871 they were September, October, and November.

30. That with respect to the aggregate rainfalls of the three wettest consecutive months, the years arrange themselves, in descending order, thus:—1865, '67, '68, '66, '71, '69, '70, and '64—the first being the wettest, and the last the driest, year of the eight.

31. That the aggregate rainfalls of the three wettest consecutive months have varied from 18.69 inches in 1865, to 8.33 inches in '64, and have averaged 13.51 inches.

32. That the ratios of the aggregate rainfalls of the three wettest consecutive months to the annual rainfall in each year, have varied from 40·7 per cent. in 1865, to 33·1 per cent. in '69, and averaged 37·2 per cent.

33. That with respect to the greatest monthly number of wet days annually, the years arrange themselves, in descending order, thus:—1668, '66, '67, ('65, '69,) ('64, '71), and '70.

34. That the greatest monthly numbers of wet days have varied from 30 days, in December 1868, to 18, in October 1870, and have averaged 24 days.

35. That with respect to the least monthly fall annually, the years arrange themselves, in descending order, thus:—1866, '67, '64, '71, '69, '68, '70, and '65.

36. That the annual least monthly falls varied from .95 inch, in July 1866, to 0 in September 1865, and averaged .43 inch.

37. That the ratio of the least monthly fall in each year, to the annual rainfall, varied from 2·3 per cent. in 1866, to 0 in '65.

38. That with respect to the aggregate rainfalls of the three driest consecutive months, the years arrange themselves, in descending order, thus:—1865, '71, '67, '66, '64, '68, '70, and '69.

39. That the aggregate rainfalls of the three driest consecutive months have varied from 7 inches in 1865, to 1·30 inch in '69, and have averaged 4·22 inches.

40. That the ratios of the aggregate rainfalls of the three driest consecutive months to the annual rainfall in each year have varied from 18·9 per cent. in 1867, to 3·6 per cent. in '69.

41. That with respect to the least monthly number of wet days annually, the years arrange themselves, in descending order, thus:—1866, '64, '69, '71, ('67, '70,) '68, and '65.

42. That the least monthly number of wet days, annually, varied from 11 in July 1866, to 0 in September '65, and averaged 5 days.

43. That the only rainless month during the eight years was September 1865.

44. That no month during the eight years had rain on every day.

45. That in their average rainfall January stood at the head, and June at the bottom, of the list of months.

46. That the greatest monthly contribution to the year's total rainfall was that of December 1868, and amounted to 22·7 per cent.

47. That, from year to year, June fluctuated least, and September most, in their contributions to the annual rainfall.

48. That no month received its maximum rainfall in 1864, 1870, or 1871, and none its minimum fall in 1866.

49. That, except in 1868 and 1871, more than 25 per cent. of the year's rain had fallen every year at the end of March; and, with the exception of 1866 and '67, less than 75 per cent. had fallen annually at the end of September.

50. That in their average number of wet days January stood at the head, and June at the bottom, of the list of months.

51. That the greatest monthly contribution to the year's total number of wet days was that of December 1868, and amounted to 17·5 per cent.

52. That, from year to year, January fluctuated least, and September most, in their contribution to the annual number of wet days.

53. That no month received its maximum number of wet days in 1869 or '70, and none its minimum in 1866.

54. That more than 25 per cent. of the annual number of wet days had occurred every year at the end of March, and with the exception of 1866 and '67, less than 75 per cent. had occurred at the end of September.

55. That the greatest average wet-day rate of rain during any month was that of June 1865, and amounted to '61 inch.

56. That, from year to year, February fluctuated least, and June most, in its average wet-day rate of rain.

57. That no month had its maximum or minimum average wet-day rate of rain in 1864.

58. That the number of days per year on which more than ·5 inch of rain fell, varied from 31 in 1865, to 8 in 1864, and averaged 19; that those on which more than 1 inch fell varied from 6 in 1865, to 1 in 1864; those on which more than 1·5 inch fell varied from 3 in 1867, to 1 in each of the years 1865, '68, and '70—there being no such falls in '64, '66, '69, or '71.

59. That only one instance of a fall exceeding 2 inches occurred during the eight years.

60. That during the eight years there has been no rain on May 29th, June 9th, or 25th, July 30th, or November 3rd.

61. That during the eight years as a whole the greatest aggregate rainfall on any the same day of the month was that of February 4th, amounting 3·04 inches.

NOTE ON AN EXPERIMENT TO PREDICT THE ANNUAL RAINFALL.

BY W. PENGELLY, F.R.S., F.G.S.

(Read at Exeter, July, 1872.)

THOUGH the slenderest experience suffices to show that the Rainfall during any given month varies considerably from year to year—September, for example, being quite rainless in 1865, and in 1866 having rain on every day save one, and an aggregate fall of 8·89 inches,—it by no means follows as a matter of course that the contribution of the same month, or of the entire period from the beginning of the year to the end of the month, to the total rainfall of the year, will be characterized by fluctuations as strongly marked. These ratios can only be determined by actual and careful observations extending over several years.

Having registered the rain at my house during the seven years ending with December 31, 1870, I amused myself at the end of each month in 1871, in calculating, from the aggregate rainfall from the beginning of the year, and the data which the previous seven years had furnished, what the total rainfall of the year might on the average be expected to amount to, and what would probably be its maximum and minimum limits.

It cannot be necessary to observe that I by no means expected the monthly results to agree amongst themselves, even approximately; nevertheless it neither appeared unphilosophical to ascertain how far the *calculated* and the *observed* annual rainfalls might differ from one another, nor to be a waste of time if the experiment resulted in showing the method to be utterly valueless.

The following example will serve to illustrate the method adopted in the calculations:—If the total rainfall of each year be supposed to be divided into 1,000 equal parts, the aggregate rainfall of the first two months during the seven

years from 1864 to 1870 inclusive, have fluctuated from 276 to 176 such parts (in 1866 and 1868 respectively), and have averaged 230. During 1871, the total rainfall of January and February together amounted to 5·93 inches; hence, if the previous seven years had furnished sufficient data for the determination of the point, it was obvious that the total rainfall of 1871 might be expected to be about 25·78 inches ($= 5\cdot93 \div 230$), and that it would neither exceed 33·69 inches ($= 5\cdot93 \div 176$), nor fall below 21·49 inches ($= 5\cdot93 \div 276$).

As a matter of fact, however, the actual rainfall of 1871 amounted to 36·72 inches, that is 3·03 inches, or 9 per cent. above even the calculated *maximum*. In other words, the year took the earliest opportunity to show that the method was, at most, of very little value.

The following table shows, 1st, the actual rainfall of each month separately; 2nd, the actual rainfall from the beginning of the year to the end of each month; and 3rd, the calculated minimum, mean, and maximum total rainfalls of the year respectively.

TABLE I.

	Actual rainfall in inches to the end of each month, from the beginning of the		Calculated total rainfall of the year in inches.		
	Month.	Year.	Minimum.	Mean.	Maximum.
January . .	3·48	3·48	21·09	25·59	37·02
February . .	2·45	5·93	21·49	25·78	33·69
March . .	1·81	7·74	20·31	24·04	33·22
April . .	4·80	12·54	27·87	34·17	43·24
May . .	0·34	12·88	22·25	28·00	37·01
June . .	2·18	15·06	25·10	30·80	42·30
July . .	4·28	19·34	26·53	36·22	53·13
August . .	1·11	20·45	26·56	34·66	44·26
September . .	7·10	27·55	32·92	39·75	46·46
October . .	4·48	32·03	35·16	40·44	48·17
November . .	1·31	33·34	35·32	38·06	43·13
December . .	3·38	36·72	36·72	36·72	36·72

The following are the prominent facts of the Table :—

1st. The *actual* annual rainfall exceeded every calculated *minimum*.

2nd. The *actual* annual rainfall exceeded all the *means* cal-

culated from the data furnished by the first eight months of the year, but fell below all those obtained from the remainder.

3rd. The *actual* annual rainfall exceeded the *maxima* calculated from the data furnished at the end of February and March, but fell below those calculated from the figures at the end of each of the remaining months.

4th. The *actual* annual rainfall differed but little from the *means* calculated from the data at the end of July, exceeding it by .5 inch only.

To facilitate comparison, the following Table has been calculated from Table I., the actual annual rainfall (36.72 inches) being put = 1,000 and the successive calculated *minima*, *means*, and *maxima* equated to it.

TABLE II.

	Calculated total annual <i>Relative Rainfall</i> .			Range of Fluc- tuation.
	Minima.	Means.	Maxima.	
January . .	574	697	1008	434
February . .	585	702	917	332
March . .	553	655	905	352
April . .	759	931	1178	419
May . .	606	763	1008	402
June . .	684	839	1152	468
July . .	722	986	1447	725
August . .	723	944	1205	482
September . .	896	1083	1265	369
October . .	957	1101	1312	355
November . .	962	1036	1175	213
December . .	1000	1000	1000	0

From the right hand column of Table II., it appears that the difference between the calculated maximum and minimum annual rainfall, that is the range between the limits of probable error, was least in November; but that even then, at the end of the eleventh month of the year, it amounted to as much as 21.3 per cent of the whole, ranging from 3.8 per cent. below, to 17.5 per cent. above, the truth.

NOTES ON THE *MACHAIRODUS LATIDENS*
FOUND, BY REV. J. MACENERY, IN KENT'S
CAVERN, TORQUAY.

BY W. PENGELLY, F.R.S., F.G.S.

(Read at Exeter, July, 1872.)

OF the discoveries made in Kent's Cavern, next to the Human Industrial Remains, none have attracted so much attention, or excited so much interest, as the teeth of *Machairodus latidens*, formerly known as *Ursus cultridens*, found by the Rev. J. Mac Eneray in January, 1826. Nor is this interest diminished by the fact that during the careful, systematic, and uninterrupted exploration of the Cavern from March 28, 1865, to the present time, no further trace of the great "sabre-toothed felis" has been met with.

Two questions have recently been opened respecting the teeth Mr. Mac Eneray found, and to these I purpose devoting the present paper. Briefly, the questions are—

- I. How many teeth were found ?
- II. What was their era ?

I. On the first question, Mr. Mac Eneray says, "Up to the present time it [Machairodus] seems to be confined to the three localities specified [the bed of the Val d'Arno, the cave of Lunel near Montpelier, and Kent's Hole] in Italy, France, and England; and with respect to the cave of Kent's Hole it is scarce, only five teeth having been found."*

His description of the specimens, and his figures of them, † render it certain that they were five canines.

In a subsequent passage, he says, "In addition to the canines, I have lately discovered, in the same bed, a small tooth about an inch long;‡ and he hesitates as to whether or not it is an incisor of the same species. This tooth, however,

* "Trans Devon. Assoc." vol. iii. p. 369.

† See "Plate F." in "Cavern Researches," edited by E. Vivian, Esqr. 1859.

‡ "Trans. Devon. Assoc." vol. iii. p. 370.

was described and figured by Professor Owen, in 1846, as the upper, right, external incisor of *Machairodus latidens*.*

These are the only statements made by Mr. Mac Enery containing any reference to the number of teeth he found; and in accordance with them, the first question has, until very recently, received the reply, "The teeth were six in number,—five canines and one incisor."

In 1869, I had the pleasure of stating that the five canines had all been traced, and that one was in the British Museum, one in the Museum of the Royal College of Surgeons, London, one in the Museum of the Geological Society of London, one in the University Museum, Oxford, and one in the collection of Sir W. C. Trevelyan, Bart.† It may now be added that the last has been presented to the Museum of the Geological Survey, Jermyn Street, London.

It has recently been suggested, 1st, That there was probably a *sixth* canine, and, 2nd, That there were *two* incisors. I propose to investigate these suggestions in the order in which they stand.

1st. In 1871, I had the good fortune to give publicity for the first time to three letters bearing on the Kent's Hole Machairodus—one from Mr. Mac Enery to Mr. Harcourt, and one each from Dr. Buckland and the Baron Cuvier to Mr. Mac Enery.‡ The object of Dr. Buckland's letter was to inform Mr. Mac Enery that Cuvier had identified the canines in question as those of *Ursus cultridens* (now *Machairodus latidens*), and of Cuvier's to thank the same gentleman for specimens from the Cavern, which he had sent to the Museum of Natural History in Paris,—no doubt, the Museum in the Jardin des Plantes.

What has become of the originals of the two latter letters there are probably no means of determining, but, happily, copies of them, sent with some of the Kent's Cavern fossils, and a "correct cast of one of the serrated teeth of *Ursus cultridens*," by Mr. Mac Enery to the Yorkshire Philosophical Society, have been preserved, together with Mr. Mac Enery's letter descriptive of his donation, in the archives of that body.

The Rev. J. Kenrick, an active and influential member of the Society, through whose kindness those documents reached me, was so good as to send also the following information

* See "Hist. Brit. Foss. Mam." &c. pp. 177 and 182.

† See "Trans. Devon. Assoc." vol. iii. p. 494.

‡ Ibid. vol. iv. pp. 471-6.

respecting the specimens received at York. "They are thus mentioned," he says, "in the list of Donations, '28 specimens and casts of teeth and bones of Bear, *Hyæna*, Tiger, Horse, Rhinoceros, Ox, Deer, Elk, &c., from Kent's Hole Cavern, Torbay.' In the report drawn up by Mr. [Rev. W. V.] Harcourt [President of the Society] they are thus spoken of:—'The remains of antediluvian quadrupeds from Torbay were accompanied by an interesting communication from the donor, who having placed a similar collection in the hands of M. Cuvier, had obtained his opinion upon them. That eminent naturalist found one of the specimens, a cast of which is in the Society's Museum, to be the canine tooth of that species of bear, which he has named *Ursus cultridens*, an animal of which no remains had been previously known except a specimen of an entire skull in Val d'Arno.'

Mr. Kenrick then goes on to say, "How is the number five to which you limit the discovery of teeth of *Ursus cultridens* to be reconciled with Mr. Harcourt's statement that a specimen of that object had been sent to Cuvier, clearly distinguishing that a cast only had been furnished to our [Yorkshire] Society. Dr. Buckland's letter, too, speaks of Cuvier's satisfaction at receiving teeth. Must we not add a sixth to your list? It would be in vain now to endeavour to ascertain what Cuvier was 'empressé de déposer au Cabinet du Roi sous le nom du Donateur.' And if the Prussians bombard Paris it may be too late to inquire."

No doubt, Mr. Harcourt did say, by implication, that a specimen of the canine tooth had been sent to Cuvier; but there is nothing to show on what authority he did so. It certainly was not on anything in either Mac Enery's or Cuvier's letter. Indeed, the latter thanks the former for fossil bones, but makes no mention of teeth. Mr. Kenrick seems to have misread Dr. Buckland's letter, which certainly does not, as he thinks, "speak of Cuvier's satisfaction at receiving teeth." The only passage which can be supposed to have even a distant approach to such a meaning is the following:—"M. Cuvier was much pleased with the identity of the teeth, and more with your present."

It is quite possible, of course, that an actual tooth may have been submitted to Cuvier, but it would not therefore necessarily form part of the present. And it is equally possible that casts only were sent, which, it must be admitted, would be amply sufficient for the purpose of identification.

It is noteworthy, perhaps, that Dr. Buckland's sentence, "M. Cuvier was much pleased with the identity of the teeth,

and more with your present," appears to convey the idea that the latter was distinct from, and did not include, the teeth.

That Mac Enery did present casts of the teeth to the Museum at the Jardin des Plantes is absolutely certain, for when on a visit to the Museum on the 2nd of last May (1872) I made a special and successful search for them, and when standing with the casts before me, made the following notes respecting them :—" In the Palæontological Museum at the Jardin des Plantes there are three plaster casts of teeth of Machairodus from Kent's Cavern—two canines and one incisor. The following three labels accompany them :—

" Label 1. ' *Felis cultridens d'Angleterre.* Ost. Pl. xvii.'

" Label 2. ' Modèles en plâtre de 2 canines supérieures donnés par Mr. Mac-Enri.'

" Label 3. ' Modèles en plâtre d'une Incisive sup. par Mr. Mac-Enri.'

There was certainly no actual tooth of Machairodus from Kent's Cavern in the collection, and when it is remembered that Mac Enery died in February, 1841, it will be seen that these casts have been preserved upwards of 30 years ; and it cannot be supposed that the officials would have been less careful of an actual fossil than of a cast of it, nor that if Mac Enery had presented an actual tooth, he would have presented a cast of it also.

It may probably be concluded with perfect safety that there is nothing warranting the belief that more than five canines were found.

2. In proceeding to the question of the number of the incisors, it may be well to commence, as before, with Mac Enery's statement, which is as follows :—" In addition to the canines, I have lately discovered in the same bed, a small tooth about an inch long. The internal face of the enamel is fringed with a serrated border. This tooth is distinguished farther by two tubercles or protuberances at the base of the enamel, from which the serration springs and describes a pointed arch on the internal surface—vid. fig. 8, 9. The body of the tooth in this specimen is not compressed, but rounded. Whether this belongs to an inferior species of the *Ursus cultridens*, or is simply the incisor anterior to the canine of the large species of *Ursus cultridens*, I am not able to pronounce with certainty. If merely the incisor, it is still interesting as it serves to show that the serrated character is not confined to the canines, and that the rest of the teeth,

and consequently the frame, are marked by a peculiar conformation."*

There is no further mention of an incisor of Machairodus in the Mac-Enery Manuscripts.

The following are the chief points of the foregoing paragraph :—

1. No more than one incisor had been found when the passage was written.
2. It was found some time after the canines, and not long before he wrote,—as he had "*lately* discovered" it.
3. It was about an inch long.
4. There were two tubercles at the base of the enamel.
5. It was serrated on the internal face of the enamel.
6. The serration sprang from the tubercles.
7. The serration formed a pointed arch.
8. The body of the tooth was not compressed [as in the case of the canines], but was rounded.
9. Two figures of it—"8 and 9"—had been, or were to be, taken.
10. The Plate containing the figures is not indicated in any way.
11. The Plate contained, or was to contain, at least nine figures.
12. Both margins of the internal face were serrated [as may be inferred from 6 and 7].

It is well known that Mr. Mac Enery had issued a prospectus of a work to be entitled "Cavern Researches," and illustrated with "thirty plates;" † that the work was never published, though a considerable part of it was written; that seventeen of the lithographed stones were discovered by Mr. Vivian, who, in 1859, gave impressions from them to the world; that subsequently a set of plates was presented to the Torquay Natural History Society by Mr. Gardner of Torquay, who received them from Mr. Mac Enery's executor, with the information that they had been Mr. Mac Enery's property; and that this set contained two not included in the seventeen published by Mr. Vivian, but clearly belonging to the same series, thus making a total of nineteen out of the "thirty."

"Plate F" in this series contains seven figures representing, in the natural size, different aspects of three of the Kent's Hole Machairodus canines, but no figure of the incisor. Nor does any other known Plate of the series contain any repre-

* See "Trans. Devon. Assoc." vol. iii. p. 370. (1869.)

† Ibid. p. 198.

sentation of any portion of *Machairodus*. "Plate F," just mentioned, was delineated by "Mary Buckland," and lithographed by "G. Scharf."

It is perhaps worthy of remark that had the two figures of the incisor mentioned by Mr. Mac Enery been introduced into "Plate F," it would have contained nine figures, and the 8th and 9th—the figures he refers to in the text—would have been those of the incisor.

With the plates received by the Torquay Natural History Society from Mr. Gardner, there were several which clearly did not belong to the series just mentioned. One of these contains five figures, three of which are those of two incisors—an upper and an under according to Mr. Boyd Dawkins. Their length exceeds that given by Mr. Mac Enery, but in all other respects they answer admirably to his description, just quoted. Thus, there are two tubercles at the base of the enamel; the internal face of the enamel is serrated at each margin; the serration springs from the tubercles and forms a pointed arch; and the body of the tooth, instead of being compressed, is rounded. In short, it seems impossible to doubt that they represent incisors of *Machairodus*.

Unlike those in Mr. Mac Enery's series, the Plate contains no description of the figures in it. Indeed, the only words on it are "J. [? G.] Scharf del 1837." There is therefore no certainty that the figures are of the natural size; but assuming them to be so, they are, as already intimated, considerably longer than the incisor found by Mr. Mac Enery, if his description on this point must be taken rigorously; for, instead of being "about an inch long," they are, when measured in a straight line, from the base of the fang to the summit of the crown, 2·11 inches long, a length in which the three figures agree.

It is obvious from his "Report on British Fossil Mammalia," presented to the British Association in 1842,* that Professor Owen had seen and measured at least two of the canines from Kent's Hole; but as he makes no mention of an incisor, it may perhaps be concluded that he was not at that time aware of the existence of any such specimen. In his "History of British Fossil Mammalia and Birds," published in 1846, however, he twice mentions a Kent's Hole incisor, and gives a figure of it (Fig. 70) accompanied by the following label:—"Incisor of *Machairodus*, nat. size, Kent's Hole."

The following are his descriptions of the specimen:—"The discovery in Kent's Hole of the external upper incisor (fig.

* See "Report Brit. Assoc." 1842, p. 68.

70), having its sharp edges as strongly serrated as in the great falciform canines, left little doubt that they appertained to the same species, and afforded corresponding proof of its carnivorous character."*

Again : "The right external incisive tooth (fig. 70) strongly indicates, by the serration of the anterior and posterior margins of the crown, that it belonged to the same species as the falciform canines, and closely conforms in other respects with the external incisors of the existing feline animals. Assuming it to belong to the *Machairodus latidens*, it proves this species to have relatively larger external incisors than any of the existing Felines, or than the *Mach. megantereon*. The obtuse consolidated fang, thickly coated by cement, which this incisor, like the canine possesses, proves both kinds of teeth to have belonged to an aged animal."†

From the foregoing passages it is clear that Professor Owen regarded the tooth as the right, external, upper incisor of *Machairodus latidens*; in other words, the tooth immediately in front of the canine in the upper jaw on the right side; and that he was not aware of the existence of more than one such specimen. The Professor's Fig. 70 answers well to Mr. Mac Ener's description, except in the length of the tooth only.

In their *Pleistocene Mammalia*, Part IV.‡ Messrs. Boyd Dawkins and Ayshford Sanford have recently raised the question of the number of the incisors. Whilst they believe the canines to be five, they are induced, by the new Plate just spoken of, to believe that there were two incisors, as is shown by the following passages from their monograph :—1. "The seven teeth which afford proof of the ancient sojourn of the Machærodus in Great Britain were discovered so long ago as 1826."||

2. "Two more plates were fortunately added to these [the 17 published by Mr. Vivian] in the year 1869; and a third plate, which had not been known to be extant, was added subsequently, through which additional evidence as to the sojourn of the Machærodus in the Cave was obtained."§

3. "Out of the seven teeth of Machærodus we are able only to trace five." [They then state the distribution of the five canines.] "We are unable to trace the two

* "Hist. Brit. Foss. Mam.," &c. p. 177.

† Ibid. p. 182.

‡ See "The British Pleistocene Mammalia." By W. Boyd Dawkins, M.A., F.R.S., G.S., and W. Ayshford Sanford, F.G.S., Part iv., Pal. Soc., 1872.

|| Page 185.

§ Page 186.

incisors, one of which is figured in the Fossil Mammals, [Owen's], fig. 70."*

4. "The incisors of *Machærodus latidens* are now only known to have been found in Kent's Hole by three figures of the natural size in a lithograph which is deposited in the Museum of the Natural History Society of Torquay. The accompanying wood-cuts [Figs. 1, 2, 3, in p. 188] have been drawn on wood from a photograph of the original, which has been placed at our disposal through the kindness of the Society, and fig. 1 representing the left upper incisor, 3 is that which has been copied by Professor Owen. The anterior and posterior ridges traversing the crown are serrated, as in the canines, and at the base of each there is a well-defined cusp. The incisors [? incisor] of the left lower mandible reproduced the peculiar characters of the corresponding upper tooth, the serration being well marked, and the cusps clearly defined."†

In the foregoing passages several points present themselves for notice, and in commenting on them the numerals prefixed to the passages will be repeated.

1. Assuming that there were seven teeth, it is by no means certain that they were all "discovered in 1826." It is known from Mac Enery's "Plate F" that the five canines were found in that year, and from his text, that when he wrote (the date of which cannot be fixed within a few years) he had "lately discovered" one incisor. He is silent respecting a second incisor, and as, at least, some portion of his MS. was written after the publication of Dr. Buckland's *Bridgewater Treatise*, in 1836, it is eminently probable that, if discovered at all, it was after that date. The plate states that it was delineated in 1837.

2. Instead of the "third plate being added subsequently" to the "two more plates," they were all added at the same time, and all were equally unknown "to be extant." It does not appear to be quite certain that this "third plate" does afford additional evidence as to the sojourn of *Machærodus* in the Cave. It is only known that it was amongst Mr. Mac Enery's effects, where several plates were found that certainly did not belong to the Cavern series.

4. Mac Enery's actual statement is that he found *one* incisor in the Cavern. There is nothing on the plate to show that the specimens figured in it were "found in Kent's Hole." All the plates known to belong to the Cavern series are defined by letters; this plate has no letter. They all state where the

* Page 186.

† Pages 187-8.

objects they represent were found, the locality being "Kent's Hole, Torquay," in eighteen of them; and in the nineteenth, (Plate U, containing figures of flint tools, no doubt for comparison,) the localities are "Stonehenge and Mexico;" but this new plate mentions no locality. They are all silent respecting the date on which they were drawn or lithographed, but the new plate states that its date was 1837. There is nothing in the "third plate" to show that the figures are, as Messrs. Dawkins and Sanford state, "of the natural size;" whilst with two exceptions ("N" and "O") a statement as to the size is made on all those of the Cavern series. Instead of being "a lithograph," the plate under consideration is but a drawing. From the statement of the authors just quoted, it appears that the two teeth are corresponding upper and lower *left* incisors, and that the former "is that which has been drawn by Professor Owen. The Professor, however, states that his figure was that of an upper *right* incisor.

As the facts now stand we may venture on the following statements:—

1. The figures (8 and 9) to which Mr. Mac Enery referred are not known. He could have had no reference to the Plate presented by Mr. Gardner to the Torquay Natural History Society, as that contains *three* figures of incisors of Machairodus, which, as there are five figures in the Plate, must have been 1, 2, and 3, or 3, 4, and 5,—not 8 and 9.
2. One incisor only is mentioned by either Mr. Mac Enery or Professor Owen.
3. Though the Plate under consideration was no doubt the property of Mr. Mac Enery, there is no evidence that it represented Kent's Cavern fossils.
4. But if it did, it appears that *two* incisors must have been found.
5. The figures in the Plate in question, like Professor Owen's figure, represent specimens larger than that described by Mr. Mac Enery; but he may not have measured his specimen, and may have under-estimated its length.
6. A second incisor may have been found after his description was written; and this is not inconsistent with the date on the Plate.
7. But if so, it was either not sold with his effects, or it found its way into some private and obscure collection.

II. On entering on the consideration of the Era of the Kent's Cavern Machairodus I shall, as before, begin with

Mr. Mac Enery's statements, selecting such only as have a bearing on this question.

1. "Plate F," containing seven figures of canines of Machairodus, is thus labelled:—"Teeth of *Ursus cultridens* Found in the Cave of Kent's Hole, near Torquay, Devon, by the Rev. Mr. Mc Enery, Jany., 1826, in diluvial Mud, mix'd with Teeth and gnaw'd Bones of Rhinoceros, Elephant, Horse, Ox, Elk and Deer, with Teeth and Bones of Hyænas, Bears, Wolves, Foxes, &c."

2. "It is worthy of remark that the remains of *Ursus cultridens* do not appear here [the Bear's Den] no more than among the Bears in the German caves, though it does, as we shall see, in other chambers with Elephants."*

3. "To enumerate the amount of fossils collected from this spot [the Wolf's Cave] would be to give the inventory of half my collection, comprising all the genera and their species, including the Cultridens.†

4. "It is impossible, without the suspicion of exaggerating, to convey an idea of the enormous aggregation of remains, including the new species of *Ursus cultridens* in this retired branch [the Wolf's Cave]. They were heaped in incredible quantities against the opposite foot of the cave; some fastened like stakes into the fissures and interstices from which it was impossible to dislodge them without taking them to pieces; other specimens bore marks of contusion, as if occasioned by repeated blows against the sides; whilst others were literally shivered to pieces. On the other hand many fine and delicate specimens, among which was *Ursus cultridens*, were found quite uninjured in the midst of the shattered bones."‡

5. "It is curious that in that district of the Cave [the Bear's Den] which was usurped by the species just enumerated [the Cave-bear] as its exclusive Den it has not discovered itself . . . but in the mixed assemblage of bones."||

6. "They are all gnawed at their base."§

7. "In addition to the canines, I have lately discovered in the same bed a small tooth [the incisor] about an inch long."¶

8. "The occurrence of this curious species among numerous remains of various ruminants and carnivora unfolds a complete analogy between the former population of this country and of the warmer climates of Italy and France, and that

* "Trans. Devon. Assoc." vol. iii. p. 240.

† Ibid. p. 243. ‡ Ibid. p. 294. || Ibid. p. 369.

§ Ibid. p. 370. ¶ Ibid. p. 370.

those countries were so constituted that [they were] habitable by the respective inhabitants of the torrid and frigid zones."*

9. "Jaws, or, rather, mere membranous shells, enclosing the rudiments of second sets of teeth advancing beneath the milk ones, which themselves are still standing and which with the least removal or violence would have fallen out. Such likewise are the delicately-edged and compressed teeth of *Ursus cultridens*."[†]

The foregoing quotations may for the present purpose be thus briefly summed up:—1. No teeth of Machairodus were found in that part of the Cavern in which the deposit contained remains of bears exclusively, and which was therefore termed the "Bear's Den."

2. They were met with in the "Wolf's Cave" mixed with the remains of all the ordinary cave mammals.

3. Though mixed with remains some of which bore marks indicative of contusion, they, with some others of delicate structure, had no such marks or indications.

4. Their fangs had been gnawed.

I am able to confirm the statement that at least one of the canines had been gnawed. When inspecting the specimen in the Jermyn Street Museum, in May last (1872), I noticed teeth marks on its fang, and called the attention of Mr. Etheridge, F.R.S., to them, who concurred with me respecting them. The gnawing has been also recognized by Messrs. Dawkins and Sanford.[‡]

In order to form a proper estimation of the value of the foregoing statements in the present discussion, it is necessary to have a clear understanding of the character, situation, and osseous contents of the Cavern deposits.

In certain branches, such as the "Bear's Den," mentioned by Mr. Mac Enery in two of the passages just quoted (2 and 5), and the "South West Chamber," "Water Gallery," and "Charcoal Cave," explored by the Committee appointed by the British Association, there was an old deposit, frequently forming a rock-like mass, and termed "Breccia," in which were found, by both Mr. Mac Enery and the Committee, the remains of bears only. They occurred in very great numbers, but both parties stated that none of them were gnawed. Thus, Mac Enery said, "In no case were they [the bones] or the skulls broken or gnawed like those in the other parts. The long bones were found generally entire, and when observed broken, it was only mechanically from pressure."^{||}

* Ibid. p. 371. † Ibid. p. 457. ‡ Op. cit. p. 191.

|| "Trans. Devon. Assoc." vol. iii. pp. 239-40.

A less ancient deposit, but still old enough to be replete with remains of extinct animals, known as "Cave-earth," occupied a much larger area in those parts of the Cavern which have been explored. In the "South-West Chamber" and Water Gallery it was found vertically overlying the "Breccia," but separated from it by a very thick bed of stalagmite; and in the same position in the Charcoal Cave, but without any such separating formation. In the "Lecture Hall," immediately north of the South-West Chamber, there were found incorporated in the Cave-earth, or less ancient deposit, detached masses of the Breccia, of various sizes, and, thanks to the rock-like character, retaining their individuality, and distinct from the deposit in which they lay. They were remnants, of course, of the more ancient deposit, which in parts of the Cavern had been broken up, and many of them contained remains of the bear, and of the bear only.

Now, as it is certainly probable, to say the very least, that some fossils from the "Breccia" may have become entirely detatched from their matrix, and subsequently re-deposited in the Cave-earth, it is of the highest importance to enquire whether or not this has been the history of the teeth of the Machairodus, and Messrs. Dawkins and Sanford have done well in giving the problem great prominence in their monograph.

"Was it," they say, "living at the time of the older deposit, and did it become extinct before the newer had been formed? It is impossible to give a distinct answer to these questions; but a careful examination of all the circumstances tends to the belief that the older was that to which the Machærodus belongs. Since it is a species which differs but slightly from the *M. cultridens*, and belongs to a genus which inhabited Europe in the Meiocene and Pleiocene ages, its affinities are undoubtedly Pleiocene, and it belongs to a group of animals that inhabited Europe before the lowering of the temperature brought about the invasion of the Arctic Mammalia from the north and the east. On the other hand, in the teeth-marks on the incisors, . . . as well as on the canines, we recognize the unmistakable traces that the animal to which they belonged fell a prey to the Hyena; and since the Pleistocene *Hyæna crocuta* (var. *spelæa*) is abundant in the cave, to its teeth the marks in question may probably be referred. It seems, therefore, to us, to be almost certain that the animal inhabited Devonshire during an early stage of the Pleistocene, and most probably before the Arctic invaders had taken full possession of the valley of the English Channel, and of the

low grounds which now lie within the hundred fathom-line along the Atlantic shore of western France. Along a great, fertile, low-lying region, which then was offered by what is now the bed of the sea, there must necessarily have been a swinging to and fro of animal life ; and before the temperature of France had been sufficiently lowered to exterminate or drive out the southern forms, it is most natural to suppose that in warm seasons some of the southern Mammalia would find their way northwards, and especially a formidable carnivore such as the Machærodus. The extreme rarity of its remains forbids the hypothesis that it was a regular inhabitant of Britain during the Pleistocene age. It seems, therefore, to us that it belongs to the earliest stage in the complicated history of the deposits in Kent's Hole, and that it probably became extinct before the great majority of Pleistocene caves in Great Britain had been filled with their present contents."*

Whilst I cannot but admire the clearness and forcibleness of the foregoing quotation, the conclusion does not appear to me to be borne out by the facts of the case.

1st. It would be very remarkable, it would, indeed, be astonishing, if the Machairodus belonged to the era of the "Breccia," that no remains of it should have been found among the vast assemblage of bones, skulls, and teeth found in that deposit, and which in many places formed 50 per cent. of the entire mass. So numerous were they, that, to use the language of one of the workmen, "they lay about as if they had been thrown there with a shovel."† Yet says Mac Enery, "The remains of Bear prevail here to the exclusion of all others," and this is echoed by the Committee now at work in the Cavern. This still remains to be a truth alike in the "Bear's Den," which takes its name from the fact, in the "South West Chamber," the "Water Gallery," and the "Charcoal Cave;" alike in the undisturbed Breccia, and the detached portions of it found in the Cave-earth in the "Lecture Hall."

2nd. The remains in the "Breccia" are highly mineralized. Thus, Mac Enery says, "The bones . . . seemed mineralized ; they were double the weight of those in the other chambers ; were brittle and broke sharply off like petrified substances ;"‡ and the testimony of Messrs. Dawkins and Sanford is to the same effect.|| The canines of Machairodus, however, which I have seen are by no means in that condition,

* Op. cit. p. 191. † "Brit. Assoc. Report," 1868, p. 55.

‡ "Trans. Devon. Assoc." vol. iii. p. 239.

|| Op. cit. p. 190.

but, on the contrary, resemble the specimens found in the Cave-earth.

3rd. None of the remains found in the "Breccia" are scored with teeth marks, nor have any traces of the hyæna's bones or coprolites been detected in that deposit. There is nothing, in short, to mark the presence of any ossivorous animal. All are agreed, however, that the teeth of Machairodus have been gnawed; and in the Cave-earth in which they were found the teeth and jaws of hyæna exceed those of any other kind of animal. If, as seems probable, and as Messrs. Dawkins and Sanford admit,* this gnawing is to be ascribed to the hyæna, there can be no reasonable doubt that the era in which it was done was that of the Cave-earth.

4th. Mr. Mac Enery's exploration of the Wolf's Cave, in which he found the teeth, was very partial; and his examination of the deposit he excavated was by no means exhaustive. As was his wont, he did not remove the material from the Cave, but simply threw it on one side. The Committee appointed by the British Association have lately given this dislodged Cave-earth a very careful re-examination, and have found in it remains of Rhinoceros, Horse, Ox, "Elk" (*Megaceros*), Deer, Hyæna, and Bear; of all the animals, in short, excepting Elephant, Wolf, and Fox, with which Mr. Mac Enery stated in "Plate F" he found the teeth of Machairodus mixed.

5th. The dislodged material just spoken of has been taken out of the Wolf's Cave by the Committee, who have broken up the deposit left intact by Mac Enery to a depth of two feet below his excavations. These two feet consisted throughout of typical cave-earth, without any indication of the "Breccia," either *in situ* or in incorporated fragments, and contained a large number of the teeth and bones of every kind of animal, without a single exception, with which Mac Enery found the teeth of Machairodus mixed.

6th. Though some of the specimens with which they were found were apparently much contused, the finely-serrated teeth of Machairodus and many other delicate specimens were quite uninjured; a fact scarcely consistent with the hypothesis of dislodgment and re-deposition.

In conclusion, I may state my opinion on the three points raised briefly thus:—

1st. There is no reason whatever for believing or suspecting that more than five canines were found by Mr. Mac Enery.

* Op. cit. p. 191.

2nd. The evidence that more than one incisor was found by Mr. Mac Enery is not conclusive.

3rd. *Machairodus latidens* belonged to the era of the Cave-earth of Kent's Cavern. There is, at present, no evidence that it belonged to the earlier period represented by the "Breccia;" and should such evidence present itself hereafter, it will simply prove that, like *Ursus spelæus*, *Machairodus* belonged to both eras.

P. S. Since this paper was read, a fine incisor of *Machairodus latidens* has been found in Kent's Cavern, by the exploring Committee appointed by the British Association. It answers admirably to the description given by Mac Enery of the incisor he found, excepting its size only, and was lying with the left lower jaw of bear, in the uppermost foot-level of the Cave-earth, and having teeth of hyæna, bear, and horse vertically under it; thus, confirming the conclusion I have already arrived at respecting its era.

The following careful measurements show the dimensions of the incisor figured by Professor Owen (I), the middle figure in the new plate (II), and the specimen found by the British Association Committee (III).

	I Inches.	II Inches	III Inches.
Length, in a straight line, from vertex of crown to base of fang	1.97	2.11	2.11
Length, in a straight line, from vertex of crown to top of tubercle on concave side	.65	.71	.76
Length, in a straight line, from vertex of crown to top of tubercle on convex side	.70	.67	.70
Length, in a straight line, from top of tubercle to base of fang on concave side	1.32	1.32	1.39
Length, in a straight line, from top of tubercle to base of fang on convex side	1.54	1.56	1.65
Greatest thickness of fang . . . . .	.55	.56	.65

"IS IT A FACT?"

BY W. PENGELLY, F.R.S., F.G.S.

(Read at Exeter, July, 1872.)

EVERY one who has had occasion to verify a statement or quotation, or has watched or traced the progress of a story as it passes from one person to another, must have had his faith shaken in much that passes as History, and felt himself drifting more or less rapidly towards that condition which asks respecting at least very many a statement "Is it a fact?"

Those desirous of cultivating this sceptical spirit have simply to join on a few occasions in the game known as "Russian Scandal," and played in the following manner:—Let there be in a room any number of, say a dozen, persons. The first writes a brief story or anecdote, which should not occupy more than about one side of a sheet of note paper, and, in order that it may be certainly new to every one present, it had better be invented for the occasion. This having been completed, the writer takes any one of the party, whom we will call the *second* person, into another room, informs him that the story is to be read deliberately to him, that he is to do his utmost to remember it, and to narrate it faithfully to the *third* person, who will be sent to him by the *first*, and must be informed that he must in like manner tell the story to the *fourth*, and so on to the *twelfth*. When the story has gone the round of the company, the last person returns to the room and repeats it to the entire party, or, better still, writes it and then reads it to them. The original is then read also, when the difference between the two versions, or, rather, stories, will amuse every one, and astonish the novices. Yet, how much of that which we call History is equally trustworthy? Twelve persons of probably cultivated minds, and desirous of being correct, pass the story from one to another whilst it is still fresh in their memories, occupying no more probably than a quarter of an hour in

doing so ; and yet, in many cases, the story becomes so utterly metamorphosed that, when written or told by the twelfth, it has scarcely anything in common with that which the first wrote.

The discrepancies in the narratives of a dozen eye-witnesses of the same event are sometimes very startling. Here, however, other sources of error besides defective memory come into play. Every person's narrative is necessarily to some extent subjective. There were things in the event to which his mind was keenly alive, and which he watched almost to the exclusion of other points equally important ; whilst these, in their turn, took almost exclusive hold of another observer, and so on.

Further, observers frequently make themselves partizans, and sometimes without being able to account for it. In their narratives they unintentionally soften or suppress certain facts, and give undue prominence or a strong colouring to others.

It may be well to state thus early that, in the course of this paper, some illustrative cases which have occurred within my own experience will be given. They will be stated with the most scrupulous regard to accuracy, with the single exception that, where it seems desirable, the names of persons and places will be fictitious.

Not long ago I was informed by a gentleman, whom I will call *Mr. Lopp*,* that *Miss Pontoon*, a friend of his, had seen at Westward Ho, North Devon, a man from Birmingham converting the flints he found on the strand into knives, which he sold to various museums at a great price ; and that he visited the place every summer, as the flints found there were of a superior quality for the purpose of his trade. There was much in the story calculated to inspire one with doubt, and as it was supposed, by both the lady from whom it had come and the gentleman who told it me, to be fatal to the doctrine of the great antiquity of Man, I expressed a wish to examine it thoroughly. *Miss Pontoon* was readily induced to give me permission to make the investigation, and to publish the result. In order to render all the assistance in her power, she sent me through *Mr. Lopp* the following written statement :—" About the beginning of August, 1866, we were at Westward Ho, and one day calling at '*Horsa*' we were shown into one of the lower sitting rooms to wait, and the apology made to us for the litter of the room, which was

* Throughout this paper fictitious names are printed in italics.

a good deal strewn with stones, &c., was that they were the property of a gentleman who came generally every year to collect them from the pebble ridge and make them into the knives which we saw partly finished. The woman said he came from Birmingham, and was very clever and made a great deal of money out of them, as they wanted them at the Museum." (Signed) " *M. Pontoon.*"

It will be seen that already the case has become slightly shrunken. The lady had not *seen* the Birmingham gentleman make the knives ; she had been *told*, apparently by a servant girl, that he made them.

On the day the foregoing statement reached me, I addressed the following letter "To the Lady who keeps the Lodging-house known as *Horsa*, Westward Ho."

" Lamorna, Torquay, February 2, 1869.

" Madam :—A statement, of which I enclose a copy, has just reached me from *Miss M. Pontoon* of this town, respecting a gentleman who appears to have lodged at your house in 1866 and some previous years. Will you be so good as to favour me with the gentleman's address, as I am desirous of writing him respecting the knives he makes ? Pardon the trouble I give you.—I am truly yours,

(Signed) " *Wm. Pengelly.*"

As soon as the post could bring it, I received the following reply :—

" *Horsa House, Westward Ho, 4th Feby., 1869.*

" Sir :—In answer to your note which I received this morning, I beg to state that I have no recollection of *Miss Pontoon* calling at *Horsa* in August, 1866, but about that time there was a gentleman from *Widrinker* (not from Birmingham) who was collecting flint stones which he dug out of the sands when the tide was out. He has been here every year since *Horsa* was opened, and is coming again this summer. He has collected a great number, and I believe presents them to the Museum, but I don't think he makes them into knives. Therefore your friend's mistake. The gentleman's name is *Mr. Henry Sanderson, Widrinker*. In fact he is this year the mayor of *Widrinker*; therefore perhaps you know him.

" There have been other gentlemen stopping at my house who have made collections, but none to the extent that *Mr. Sanderson* has made.

"Trusting that the above information will be satisfactory,
"I am, sir, yours very faithfully,
(Signed) "J. Elgin."

Such was, no doubt, the genuine story of the Westward Ho Flint Knives ; which, it may be stated, proved to be precisely what I expected, as the case was well known to me from the beginning. It may not be uninteresting to note the metamorphoses the story had undergone in its passage through one single person, who, though she no doubt had a decided bias, was highly educated, well-informed, and utterly incapable of intentional misrepresentation. The gentleman was not from Birmingham, but *Widrinker* ; did not make, but found, the knives ; not in the pebble ridge, but in the sands ; and did not sell, but presented, them to the Museum.

Unfortunately, moreover, a tendency to prevarication is among the defects of human nature. I refer not so much to the bolder and more audacious falsehood, as to untruthfulness in what are regarded as small things—the minor details of a narrative. Memory, perhaps, was a little at fault, or one or two links in the chain were not carefully noted, and what appeared to be the probabilities, or, if the expression may be used, the inevitabilities were called in to supply the defects. Thus, in some instances, a story is rendered more complete by him who narrates it, and this not with any desire of, or indifference to, exaggeration. On being told him, it suggested one or two things, perhaps, which were recalled on repeating it ; and, forgetting that they had really nothing to do with it, he annexed them to the story.

Not long ago I stated on a public occasion that no one knew anything about the origin of the name of Kent's Cavern, near Torquay ; that, indeed, there was not even a tradition or legend respecting it. In the course of the evening, the late Mr. Charles Babbage, who had heard the remark, told me what had once been given to him as the origin of the name. This story I, a day or two after, related at a dinner table, precisely, I believed, as it had been told to me. Within a week after it was told me, a lady, who had heard the story on the occasion last mentioned, related it to an evening party when Mr. Babbage and I were present. The following is the story as she told it :—"It is said that a dog, which was lost in the cavern, was some time after found in the county of Kent, wriggling up through a hole, and having all its hairs turned perfectly white. From this it was concluded that there was a subterranean

passage from Devonshire to Kent, and hence the name of the cavern." On being appealed to by the narrator, I remarked that with the exception of the statement respecting the colour of the dog's hair, which was quite new, the story was precisely what Mr. Babbage had told me. "Indeed, it is not," said he; "I simply said the dog, lost in the cavern, was afterwards found in Kent, but not a word about its wriggling up through a hole." There was just as much difficulty in convincing the lady that she had "improved" the story, as in satisfying me that I had achieved the same thing.

Not long afterward, I was accompanied to the cavern by a distinguished American writer, and on the way I told him the story just related, as it is given above. Subsequently it appeared in Harper's New Monthly Magazine. The following is the American New Version:—"The legend as to its name is, that a traveler went in there with his dog: the traveler was never again heard of, but the dog was found in a weak condition in the county of Kent, about 170 miles distance."* From this we learn, what we did not know before, that the dog was taken to the cavern by a man and a traveller, who was lost; and that the dog when found was in a weak condition.

Whilst, so far as I am aware, this is the most modern form this story has assumed, the following passage in the late Mr. Mac Eney's Manuscript "Cavern Researches," apparently takes us back to its pre-canine stage. "As indicating," he says, "the popular [notion] of the indefinite range of the cave, may be noticed a tradition which is seriously told and believed. It is related that Sir George Cary, an ancestor of the present proprietor of the neighbouring abbey, dispatched a hawk with billet and bells, in the hope of discovering its furthermost outlet towards the sea. The hawk was taken on the coast of Kent, from which circumstance it is gravely affirmed it takes its name."†

Popular slipshod errors are very often floated and refloated as newspaper paragraphs. For example, the common but erroneous belief that the Fellows of the late Anthropological Society of London were believers in the ape origin of man, is likely to have been strengthened by a paragraph which nearly four years ago appeared respecting them in a popular, widely-circulated, and very able local journal, and which closed thus:—"It is rather amusing to find the Anthropologists thus in arms about such a common place matter as *cash*. One would

* "Harper's New Monthly Magazine." No. ccxiii. December, 1868.
Vol. xxxviii. p. 31.

† See "Trans. Devon. Assoc." vol. iii. p. 460 (1869).

have thought that they were a finance company disputing over directors' commissions, instead of a band of savans pledged to trace back our ancestry to the primeval ape."* It cannot be necessary to say that the Anthropological Society consisted of a number of persons who had united themselves together for the professed purpose of the study of man. Of course, there was nothing in their laws defining what they were, or what they were not, to believe; nothing to compel them, or to render it inconsistent in them, to believe or to disbelieve that man was of pithecid ancestry. Accordingly, some of them did, and some did not, accept this doctrine. If, however, the opinion of the late Dr. James Hunt, the founder of the society, if the opinion of a very large majority of the Fellows, may be regarded as indicating the tendency of the society as a whole, it unquestionably is not a fact that the anthropologists were "a band of savans pledged to trace back our ancestry to the primeval ape."

For example: "On March 1st, 1864, Mr. A. R. Wallace read to the Anthropological Society a paper on "The Origin of Human Races and the Antiquity of Man deduced from the theory of 'Natural Selection.'"† If I have correctly estimated it, this paper was the ablest advocacy of the development of man from some lowlier organism that had then been given to the world. On December 12th, 1868, Dr. Hunt, who presided when the paper was read and discussed, read to the Hastings and St. Leonard's Philosophical Society, a communication "On the Doctrine of Continuity applied to Anthropology," in which he said, "Darwinism may be true applied to botany or zoology; but there is not a fact in the whole range of Anthropology which lends it any support. I am glad to know that when Mr. Wallace first brought his views before the Anthropological Society of London, he did not find a single supporter to what I then ventured to call his eloquent dream. I for one have done all in my power to show the absurdities into which the modern advocates of Darwinism are leading their followers."

Those who have favourite, but slenderly-supported, hypotheses are greatly in danger of giving a new circulation and an increased tenacity of life to untrustworthy statements. Every alleged fact which can be made useful is hastily pressed into their service, and whatever men may think respecting

* "Western Morning News." Sep. 14th, 1868.

† "Anthropological Review and Journal of the Anthropological Society of London," vol. ii. 1864, pp. clviii. *et seq.*

that which it is made to bolster up, the statement itself attracts attention, and, thanks to the indolence too common amongst us, is not unfrequently accepted as an unquestionable fact.

Mr. Bellamy, in his "Natural History of South Devon," says, "Nennius, who wrote twelve centuries ago, reports that there subsisted then a tradition of the Isle of Wight having formerly been united to the British coast; he adds that the name of the Isle is derived from an old British word signifying a rent or separation. Still, however, the disjunction could have been but partial, as appears from this last fact, and the report of Diodorus, in the first century, that the Romans at the ebb of the sea conveyed their tin in carts from Hampshire to the 'Isle of Vectis,' or Isle of Wight."*

It is obvious that in this passage the following statements are either made or implied:—

1st.—That Nennius wrote twelve centuries before 1839.

2nd.—That he reported the existence of a tradition of the Isle of Wight having formerly been united to the British coast.

3rd.—That Diodorus wrote in the first century.

4th.—That he stated that a tin trade was carried on by the Romans with Britain.

5th.—That they conveyed their tin in carts from Hampshire.

6th.—That they conveyed their tin in carts to the "Isle of Vectis," or Isle of Wight.

I propose to enquire whether these statements are facts; and shall take them in the order in which they stand.

1st.—According to Dr. Giles, a recent editor of Nennius, "It is far from certain at what period the history [of the British, the only work ascribed to Nennius] was written, and the difference is no less than a period of two hundred years, some assigning the work to seven hundred and ninety-six, and others to nine hundred and ninety-four."† At most, therefore, Nennius wrote no more than about ten and a half centuries before 1839.

The author of the article "Nennius," in the Penny Cyclopaedia, vol. xvi. p. 142, inclines to the opinion that he "lived in the first part of the ninth century." He adds, however, that "Vossius (De Historicis Latinis, 1627,) says that he lived

* "The Natural History of South Devon." By J. C. Bellamy, Surgeon, 1839.

† "Six Old English Chronicles," edited by J. A. Giles, D.C.L. Bohn's edition, 1866, pp. vii. viii.

in the early part of the seventeenth century, but he assigns no authority for this assertion."

2nd.—After a careful perusal of his History, I find that the following is the only mention of, or allusion to, the Isle of Wight which Nennius makes:—"Three considerable islands belong to it [Britain]; one, on the south, opposite the Armorican shore, called Wight; another between Ireland and Britain, called Eubonia, or Man; and another directly north, beyond the Picts, named Orkney."*

3rd.—The Penny Cyclopædia, speaking of Diodorus, says, "He was a Greek historian born at Agyrium, in Sicily. Our principal data for the chronology of his life are derived from his own work. It appears that he was in Egypt about the 180th Olympiad, 60 B.C.; that his history was written after the death of Julius Cæsar [44 B.C.]; that it ended with the Gallic war of that General, and that he spent thirty years in writing it. In addition to this, Suidas [whose date is by no means certain] mentions that he lived in the time of Augustus [30 B.C.—14 A.D.], and he is named under the year 49 B.C. by Jerome [340—420 A.D., Pen. Cy., art. St. Jerome, vol. xiii. p. 105] in the Chronicle of Eusebius."† From the foregoing data, it is scarcely possible to avoid the conclusion that Diodorus wrote in the second half of the century before the Christian era, probably not far from its close; and that, therefore, Mr. Bellamy was wrong in placing him in the first century, unless, indeed, he meant the first century B.C. It may not be out of place to add that the compilers of the "Annales Antiquitatis" make Diodorus "flourish 60—30 B.C."‡

4th.—Instead of defining the nationality of the early traders in British tin, Diodorus simply terms them "merchants."

5th.—Instead of stating that the tin was carted from "Hampshire," or anywhere that could be supposed to be Hampshire, he stated that it was carted from the district of "the British promontory of Belerium," that is the Land's End.

6th.—Instead of stating that it was conveyed to "the Isle of Vectis" [undoubtedly the Isle of Wight], he says that it was carried to a British island near at hand called "Iktis," which there is every reason to believe was St. Michael's Mount, in Cornwall.

The following is the entire passage in Diodorus (Book v.):—"They that inhabit the British promontory of Belerium, by reason of their converse with merchants, are more civilized

* Ibid. Nennius, ch. iii. sec. 8, p. 386.

† Penny Cyclo. vol. viii. art. "Diodorus," p. 505.

‡ "Annales Antiquitatis." Oxford, 1835, p. 36, e.

and courteous to strangers than the rest are. These are the people that make the tin, which, with a great deal of care and labour, they dig out of the ground, and that being rocky, the metal is mixed with some grains of earth, out of which they melt the metal, and then refine it; then they cast it into square pieces like a die, and carry it to a British island near at hand called Iktis; for at low tide, all being dry between them and the island, they convey over in carts an abundance of tin in the meantime. (There is one thing peculiar to those islands which lie between Britain and Europe, for at full sea they appear to be islands, but at low water for a long way they look like so many peninsulas.) Hence the merchants transport the tin they buy of the inhabitants to Gaul; and for thirty days' journey they carry it on packs on horses' backs through Gaul to the mouth of the river Rhone."

It would be difficult, perhaps, to find a passage in any author more densely packed with slipshod errors, or more calculated to impress one with the duty of verification, than that just quoted from Mr. Bellamy.

With reference to the Isle of Wight, it would seem that, instead of there being a tradition of its severance from Britain, the earliest traditions recognise it as a distinct island. The following, for example, is a translation of one of the famous Welsh or British Triads:—"The three original adjoining islands of the Isle of Britain, Orkney, Man, and Wight, And afterwards the sea broke the land, so that Anglesey became an island; and in like manner the isle of Orkney was broken, so that in that place there became many islands; and other places in Alban, and in the land of Cmyru became islands."*

It is, perhaps, worthy of notice that in the passage quoted above, Nennius also speaks of the same three islands, and that he too regarded Orkney as a single island.

A few years ago I encountered the following as part of a paragraph in a religious monthly journal:—"Marazion, also known as 'Market Jew,' probably the oldest town in the County [Cornwall], and supposed to have been named by some Jews shipwrecked there when the fleets of Hirani and Solomon visited our shores."† On instituting an enquiry as to the evidence on which the assertions and implications contained in the passage rested, the writer referred me to the "Life of Mary Anne Schimmelpenninck." To this work I

* "Monthly Magazine," vol. xi. part 1 for 1801, pp. 229-230. See also "Notes and Queries," 4th series, vol. ii. 1869, p. 23.

† "The Friend." September, 1868.

accordingly turned, and found the following statements :—
 “The Village [Marazion] is venerable for its high antiquity Three thousand years ago when the Phœnicians are said to have traded to Cornwall for tin, and the fleets of Hiram and Solomon visited our distant shores, this place was the spot they more particularly resorted to

“Our own earlier historians tell us that then Mount’s Bay was not, but that a forest, deep and wild and venerable, and the scene of many Druidic rites, occupied the whole of what is now its beautiful expanse; and St. Michael’s Mount, called in Doomsday and all our ancient records ‘the hoar Mount in the wood,’ is said to have lifted up its venerable front as a beacon and land mark in the midst of dark forests, six miles distant from the sea.

“In these remote times, then, long before the sea was there, it is said that Solomon’s and Hiram’s fleets were once cast away amongst its wild rocks and caverns. Some few of the adventurous mariners are said to have escaped death, but their fleet, their friends, their means of return were cut off, and after wandering about on these shores, where the Druidical superstitions forbade their mingling with the savage Britons, the friendless Israelites here raised a few huts which grew into a village, which they called, from their distress, Mara Zion or the affliction of Zion.”*

On comparing the two passages it will be found that Marazion had become slightly more interesting under the pen of the copyist. Mrs. Schimmelpenninck spoke of it as “venerable for its high antiquity;” the writer in the “Friend” made it “probably the oldest town in the county.” Confining attention to the authoress, and to the salient points in her paragraphs, it appears—

1st. That the fleets of Hiram and Solomon visited Cornwall.
 2nd. That our own earlier historians state that at that time the area now occupied by Mount’s Bay was a forest.

3rd. That in Domesday and all our ancient records St. Michael’s Mount is called ‘the hoar Mount in the wood.’

4th. That the name “Marazion” is derived from two Hebrew words—“Mara” and “Zion”—signifying the “affliction of Zion.”

As in the last instance, the foregoing points shall be taken in the order in which they stand.

1st. Though it is admitted to be in the highest degree probable that the Phœnicians derived their tin, at least mainly, from Cornwall, there is no evidence to show that their fleets,

* “Life of Mary Anne Schimmelpenninck.” 1858. Vol. ii pp. 100-1.

much less those of Hiram and Solomon in particular, visited our shores. The passage just quoted from Diodorus proves that when he wrote the tin was carried across Gaul to the mouth of the Rhone ; but whether this was the route in the earlier times here contemplated cannot be determined with anything like an approach to certainty.

2nd. The statements of Diodorus show conclusively that before the commencement of the Christian Era, the Mount's Bay area, instead of being occupied by a forest, was in the same condition as at present. If, therefore, we are to understand, as is no doubt the case, that the authoress intended to signify English historians, when she spoke of "our own earlier historians," it is clear that she must have misunderstood, or have been misinformed, respecting their statements, or that they described a state of things which had passed away very long before their day ; and if the latter, that their so-called histories were at best but echoes of old traditions, or that they drew their statements from ancient writers of other lands—in other words, from Roman or Greek authors. When it is remembered, however, that the Romans first became personally acquainted with the island when Caesar invaded it, and when the description by Diodorus must have been strictly applicable, it is obviously necessary to proceed to the Greeks. They, however, knew nothing of this country "three thousand years ago," for Herodotus, born 484 B.C., was obliged to say, "Concerning the western extremities of Europe I am unable to speak with certainty, for I do not admit that there is a river, called by barbarians Eridanus, which discharges itself into the sea towards the north, from which amber is said to come ; nor am I acquainted with the Cassiterides islands, from whence our tin comes though I have diligently inquired, I have not been able to hear from any man who has himself seen it, that there is sea on that side of Europe."* In fact, the Greeks first obtained any certain knowledge about this country, in the fourth century before our era, from the Greek merchants of Massilia, and especially from Pytheas, who is said to have sailed round great part of it. His works, of which but few fragments remain, were treated with great contempt by Polybius and Strabo, and are neither known nor supposed to have contained anything justifying "our own earlier historians" in stating that the area of Mount's Bay was ever occupied by a forest. The truth is, as will be shown shortly, that the statement occurs in one English author only, and will prove to be not a fact.

* Cary's "Herodotus." Bohn's Ed. "Thalia," 115.

3rd. It is no doubt very probable, yet not quite certain, that one passage, and only one, under the title "Cornvalge," in Domesday Book, applies to the Mount. It may be thus translated :—"The church of St. Michael holds Treiwall.* Brisniar was holding it in the reign of King Edward. There are 2 hides which never paid the Danish tax. The land is 8 carucates. There is 1 carucate with 1 villan, and two bordarii, and 10 acres of pasture. Value 20 shillings. Of these 2 hides, Earl Moriton took away 1 hide, value 20 shillings."† This, it will be seen, is a description, not of St. Michael's, but of one of its manors. Moreover, since there are four St. Michaels in Cornwall—without reckoning Michælstow near Camelford, or the churches of Helston and Lesnewth, each dedicated to this same saint—there can be no absolute certainty, as has been already stated, that the St. Michael's of Domesday was the Mount. But waiving this, there is certainly neither mention nor intimation that it was called "the hoar Mount in the wood."

4th. It cannot be denied that if mere sound is to be the guide, the name "Marazion" is very suggestive of Hebrew derivation; and this is greatly strengthened by the fact that this same town is sometimes called "Market-Jew," which apparently has a similar origin. A slight acquaintance with the history of Cornish names, however, suffices to show the necessity of advancing warily when following such a guide, in such a district. It is scarcely possible to feel confidence in mere sound, in the county in which, by what Professor Max Müller calls Saxon puns on Cornish words, Falmouth derived its old name of "Penny-come-quick" from "Pen y cwm gwic,"—"Head of the creek valley;" the village of "Come to good," near Truro, got its name from "Cwm ty goed,"—"Wood-house Valley;"‡ and where the inhabitants of an ex-parliamentary borough, under the grateful belief that their town had taken its name from a camel, placed a figure of that beast on the town-hall as a weathercock, and then learnt that "Camelford" simply meant the "Ford of the Camel"="Crum heyle"= *Crooked river.*|| This wariness finds its reward in the fact that all students of Cornish names concur in the statement that instead of "Marazion" meaning the "Affliction of Zion," or "Market-Jew" signifying a market founded or frequented by

* A manor in the parish of St. Hillary. See "Nature," vol. iii. p. 289.

† See "Nature," vol. iii. pp. 267 and 289.

‡ "Chips from a German Workshop." By F. Max Müller. Vol. iii. p. 304. 1870.

|| See "Murray's Hand Book of Devon and Cornwall," 6th Ed. 1865, p. 212.

Jews, they are both corruptions of old Cornish names, having nothing Hebraistic about them, and traceable through many documents and in various metamorphoses back to the 13th century.*

In short, it may be doubted whether, if Mrs. Schimmel-penninck had deliberately attempted it, she could have packed a greater number of errors within the same space; and this apparently under the belief that she was communicating interesting and trustworthy information. The book in which they occur has already gone through several editions, and, as has been stated, my attention was called to it by what proved to be an unsuspected quotation from it. It may be borne in mind that this lady was the author of "Select Memoirs of Port Royal."

The literature of St. Michael's Mount is too rich a theme to be abandoned yet.

Dr. Boase, in a paper read to the "Royal Geological Society of Cornwall,"† says, "Historians state that Florence of Worcester expressly asserts that it [the Mount] was formerly five or six miles from the sea, and enclosed with a very thick wood, and therefore called in British 'Carreg lug en Kug, 'Le Hore Rok in the Wodd.'"

For the present purpose, the following may be taken as the substance of the foregoing quotation:—

1. That Florence of Worcester made express assertions respecting the Mount.

2. That his assertions were—

(a) That the Mount was formerly five or six miles from the sea, and enclosed with a very thick wood.

(b) That it was called, in British, "Carreg lug en Kug."

(c) That its British name meant "Le Hore Rok in the Wodd."

As before, these different points shall be taken in the order in which they are given.

1. Florence of Worcester died in 1118. His "Chronicle" is founded on an earlier one compiled by Marianus Scotus, a learned Irishman, who died, as a recluse at Mentz, in 1083, or as some say, 1086.‡

In order to ascertain what Florence actually said on the

* See Max Müller, *op. cit.* p. 299-329.

† "Observations on the Submersion of part of the Mount's Bay; and on the Inundation of the Marine Sand on the North Coast of Cornwall." By Henry Boase, Esq. "Trans. Roy. Geol. Soc. of Cornwall," vol. ii. p. 129, &c. 1822.

‡ See Preface to "The Chronicle of Florence of Worcester." Bohn's Ed.

subject, I some time since went carefully through his "Chronicle," and found it utterly silent respecting the Mount, as well as the district in which it is situated. Fearing I might have overlooked the passage, I applied to the late Dr. Thorp, the celebrated Anglo-Saxon scholar, and translator of Florence, and was promptly assured by him that the latter makes no mention whatever of St. Michael's Mount.

On further research it was found that it was not "Florence," but "William," of Worcester that was meant; a writer, not of the eleventh and twelfth centuries, but of the fifteenth, whose "Itineraria" was written in 1478, or 360 years after Florence died.

2. In proceeding to ascertain whether the assertions ascribed to "Florence" were really made by "William," it proved (a) That he did say that the Mount "was at first enclosed by a very dense forest six miles distant from the ocean, furnishing a good retreat for wild animals;" (b) That he did not say it was called "Carreg lug en Kug," or anything else in British; but (c) That he did speak of it as "called the Hore-rok in the Wodd."*

Before proceeding to enquire on what authority he ventured to describe a geographical condition so utterly unlike that in which he found himself, it may be interesting, and is certainly in harmony with the aim of this paper, to state that according to William "Pope Gregory, in the year 1070 [granted to] the Church in the Mount of St. Michael in Tumba in the county of Cornwall that all the faithful who enriched that church with their benefactions and alms, or visited it, should be forgiven a third part of their penances." He adds, "These words were found in ancient registers lately discovered in this church. They are publicly placed here on the doors of the church."†

In this statement William has certainly fallen into an error. He is wrong in his Pope, or wrong in his date. There was no Pope Gregory in 1070, the papal chair being then occupied by Alexander II. Gregory VI. was deposed in 1046, and Gregory VII. was not elected until April 22, 1073.

Returning to the question of the authority on which William made his assertions respecting the earlier geographical position of the Mount, it is only necessary to say that Professor Max Müller, who has recently sifted this question with great skill,

* See "Itineraria Symonis Simeonis et Willelmi de Worcestre." Edit. MDCCCLXXVIII. p. 102.

† Op. cit. p. 101.

has concluded "that the legend of the dense forest by which the Mount was believed to have been surrounded owes its origin entirely to a mistake which can be accounted for by documentary evidence. A legend told of Mont St. Michel [in Normandy] had been transferred *ipsissimis verbis* to St. Michael's Mount, and the monks of that priory repeated the story which they found in their Chronicle to all who came to visit their establishment in Cornwall. They told the name, among others, to William of Worcester, and to prevent any incredulity on his part, they gave him chapter and verse from their Chronicle, which he carefully jotted down in his diary."*

From a foot note by the learned Professor, there seems reason to believe that the "dense forest" may have wandered from Apulia to Normandy, and thence to Cornwall.

Provincial students frequently find that in order to verify a statement, they require access to libraries existing only in the metropolis. A common resource in such cases is to make use of "Notes and Queries," which is sometimes not quite so satisfactory as going at once to head quarters, as the following case will show:—

Writers on St. Michael's Mount frequently speak of a name it bore in the Cornish language, and credit Carew with the earliest mention of it. His "Survey of Cornwall," published in 1602, contains the following passage:—"St. Michael's Mount looketh so aloft as it brooketh no concurrent for the highest place. Ptolemy termeth it Ocrinum, the Cornishmen Cara Couz in Clowze, that is the hoar Rock in the Wood." It is somewhat unfortunate, perhaps, that in another passage he says "the ancient name of St. Michael's Mount was Cara-clowse in Cowse; in English, the hoar Rock in the Wood;" thus translating two different British names into the same English words.

It happened some time ago that I had occasion to consult Camden's "Britannia," when the only copy to which I had access was Gough's translation of the edition of 1607. In it occurs the statement that the ancient British name of the Mount was "Careg Cowse, *i.e.* rupis cana." As the first edition of the "Britannia" was published in 1586, that is sixteen years before Carew's "Survey," I was desirous of ascertaining whether it contained the same statement; and, for that purpose, sent the following question to "Notes and Queries":—"Does Camden in the first edition (1586) of his

* Op. cit. p. 355.

"Britannia" state, as he does in the edition of 1607 (according to Gough), that the ancient British name of the " (St. Michael's) "Mount was Careg Cowse, or the grey rock?" This query appeared on June 29, 1867, and to it was appended the following reply :—"The British name of the Mount is not in the first edition, 1586, of Camden's "Britannia" but, as given by Gough, occurs amongst the 'Additions.'" The reply was not calculated to inspire confidence, as in the edition I had consulted the name did *not* occur in Gough's "Additions," but in the original text. I happened to be in London when the answer appeared, and, not being satisfied, went at once to the British Museum, where I found five editions of the "Britannia," published in the years 1586, 1587, 1590, 1594, and 1600 respectively, that is all of them before the appearance of Carew's "Survey;" and each and all contained the same statement respecting the Mount :—"incolis Careg Cowse i. rupis cana." Hence, notwithstanding the current opinion, notwithstanding the reply in "Notes and Queries," it is not a fact that the supposed British name of St. Michael's Mount was first mentioned by Carew—it was mentioned by Camden sixteen years before; it is not a fact that the earliest known form of it was Careg Couz in Clouze—it was Careg Cowse; it is not a fact that it signified "the hoar rock in the wood"—its meaning was simply "the hoar rock." It is not a fact that the name gave any support to the legend of a great and comparatively recent loss of area in Cornwall.

That newspaper versions of scientific papers should occasionally be incorrect is in no way surprising, for there is usually no time for correcting proofs, and few reporters can be supposed to have anything like an acquaintance with the subjects, whilst the technical terms are often, for them, provoking novelties. If, however, their reports of the Bath Meeting of the British Association were to be believed, an eminent chemist stated that he had "not been able to find any 'fluidity' in the Bath waters," and a geologist asserted that the bones found in the submerged forests of Devonshire were "closely representative of the existing British 'farmer.'" To convert these assertions into facts, however, it will be needful to substitute "fluorine" for "fluidity" in the first, and "fauna" for "farmer" in the second.

The foregoing errors, it must be admitted, are at once amusing and harmless. Every reader would detect them, and, at the worst, would simply get no information from the passages. Serious blunders, however, are by no means rare.

I remember that a journal of eminence, which justly prided itself on the general correctness of its scientific reports and the space it devoted to them, once made a speaker say that there had been found in the famous Brixham Cavern "nearly the entire skeleton of a cave-bear, in the astragalus of which there was a periwinkle shell."* The readers, of course, concluded either that an old cave-man had inserted the shell in the bone, or that the limb had been carried by the sea into the cavern; neither of which would have been a fact. The speaker, however, made no such assertion. What he did say was that the bones alluded to "proved to be the entire left hind leg of a cave-bear, flexed, and having every bone in its true anatomical position, even the patella and astragalus *in situ.*"† On comparing the genuine with the spurious statement, it would seem that the reporter knew that a patella was a name for a limpet shell, but not that it was also a name for the knee-cap; and, hence, concluded that it was the former. Having made up his mind that it was a marine shell, he appears to have subsequently forgotten the particular kind, and supplied the defect with a periwinkle shell."

Again. By a local newspaper, the Committee appointed by the British Association to explore Kent's Cavern, at Torquay, are made to say, in their Fifth Report, presented at Exeter in 1869, that "in the breccia beneath the cave-earth a flint flake had been discovered associated with the remains of the cave-lion, cave-bear, and mammoth." The statement, however, was really the following:—The flake "was found in a deposit which, so far as the Cave evidence goes, was laid down before the introduction of that in which were entombed the first traces of the Cave-hyæna, Cave-lion, Mammoth, and their contemporaries." The first statement would have contained no new fact; the second was fraught with a decided and most important novelty. The first takes man back to the era of the Cave-earth, when the hyæna dragged piece-meal the dismembered remnants of various extinct mammals into the cavern; but great as this antiquity is, the second enables us to see our ancestors in a much more ancient period than cavern evidence had previously warranted—an antiquity greater than that of the cave-earth by all the time requisite for the formation of an intermediate floor of stalagmite several feet thick, and apparently prior to the arrival of the Cave-hyæna in Devonshire.

Nor is there any consolation to be derived from the sug-

* "London Review," Feb. 23, 1861, vol. ii. pp. 205-6.

† See "The Geologist," April, 1861, p. 154.

gestion that such reports in local newspapers are probably little read by the scientific world; for, unfortunately, the maltreated statement was copied in all its incorrectness by a journal exclusively devoted to science.*

It is no doubt ungrateful in me to animadvert on occasional slips in newspaper reports of scientific papers, for on account of an error of this kind a somewhat conspicuous place has been secured for me in a volume of great value and interest, the work of a distinguished author.

Professor Max Müller, in the Third Volume of his "Chips," already referred to, says—"In his paper read before the British Association at Manchester, Mr. Pengelly adduced that very name [“Cara clowse in cowse” = “the hoar rock in the wood”] as irrefragable evidence that Cornish, *i.e.* a Celtic language, an Aryan language, was spoken in the extreme west of Europe about 20,000 years ago."†

The two statements in the foregoing passage to which attention will be called, are—

- 1st. That the paper referred to was read at Manchester.
- 2nd. That I contended the Cornish language was spoken in Cornwall about 20,000 years ago.

1st. With reference to the first point, the Professor has made a mistake. The paper to which he alludes was read in 1865, not at Manchester, but at Birmingham.

2nd. Briefly, the paper was as follows:—It was formerly assumed that the Mount was called in the Cornish language “Cara clowse in cowse,” that the English equivalent of the name was “the hoar rock in the wood,” and that the name was appropriate when it was first given. Though fully aware that each of these assumptions was open to challenge, and might prove to be untrue, I at that time believed them to have a fair amount of evidence in their favour, and, hence, could not but conclude that the Mount had acquired its present well-known semi-insulated condition since the Cornish language was spoken in the district. As this insulation must have been due to a subsidence of the district, or to a wasting of the land, through encroachment of the waves, with or without subsidence—there being no other alternative,—I proceeded first to discuss the latter hypothesis—insulation through encroachment merely. It would be out of place here to go into the well-ascertained geological facts on which my argument was based, but the result was this:—On the assumptions already stated, the hypothesis of insulation by encroachment

* See “Quart. Journ. Sec.” 1869, vol. vi. p. 699. † Page 335.

only, led to the conclusion that the Cornish language was spoken in the district 20,000 years ago; which being absurd, the hypothesis which led to it was also absurd, and must be abandoned. It is not necessary to follow the paper in the discussion of the rival hypothesis—insulation through subsidence. Unfortunately, the reporter, failing to see that I was using the *reductio ad absurdum*, supposed, and informed the world, that I had contended for the twenty-thousand years antiquity of the old Cornish language, and thus furnished Professor Max Müller with his text, which, though not a fact, is the basis of a "Chip" of great interest and value.

Before leaving this topic, it may be well to guard against the chance of being misunderstood. I should be extremely sorry were newspaper editors to abandon their good old practice of giving the best reports they can of scientific papers and lectures; but I do ask those who may find any very startling statements in such reports to ascertain from the authors themselves whether they have been correctly reported, before they say of any such statement "this is a fact," or proceed to accept or use it as such.

Writers, Readers, and Speakers, have frequently to thank themselves for the errors which appear. Their penmanship is scarcely decipherable, or their style is involved and obscure, or their articulation is indistinct, or their voices are so low, that compositors or reporters have to guess at their meaning.

Sir George Cornewall Lewis, in his "Astronomy of the Ancients," after quoting the passage from Diodorus Siculus already given, and stating that "Timæus mentions an island Mictis, within six days' sail of Britain, which produced tin, and to which the natives of Britain sailed in coracles," says "The Mictis of Timæus and the Ictis of Diodorus are probably variations of the name Vectis, by which the Roman writers designated the Isle of Wight."* As this passage was generally, and perhaps not unreasonably, understood to express its author's belief that the Iktis was the Isle of Wight, Col. Sir Henry James, in 1862, called his attention to the subject. In his reply, dated June 16th, 1862, Sir G. C. Lewis says, "The passage in my volume was not intended to convey the meaning which you attributed to it. All that I meant to say was, that the names Mictis and Ictis were variations of Vectis,

* "An Historical Survey of the Astronomy of the Ancients." By the Right Hon. Sir George Cornewall Lewis. 1862. p. 453.

and arose from a confusion of that name."* He adds that he was satisfied that the Mount was the port from which the tin was shipped for the coast of Gaul.

Humboldt, in his *Cosmos*, says, "I have found by a laborious investigation, which from its nature can only give a maximum limit, that the centre of gravity of the land at present above the surface of the ocean is, in Europe 630, in North America 702, in Asia 1062, and in South America 1080 French feet (or 671, 748, 1132, and 1151 English feet) above the level of the sea.† The passage is substantially the same in Otté's translation. Sir John Herschel, in his Article on "Physical Geography," in the *Encyclopædia Britannica*, says, referring to this passage, "The following are given by Humboldt as the approximate heights of the centres of gravity of the continents above the sea level, viz., Europe 671 feet, Asia 1132, North America 748, South America 1151; from which it follows that the mean elevations of their surfaces (the doubles of these) are respectively 1342, 2264, 1496, and 2302 feet."‡ Sir John made no alteration in this passage in the Reprint of his article.|| It is obvious that he understood the author of *Cosmos* to mean that if all the land of Europe, for example, were reduced to one uniform level, on its present basis, the height of its centre of gravity would be 671 English feet. It can scarcely be doubted that from the text alone most readers would so interpret the passage, and would, like Sir John Herschel, believe they had Humboldt's authority for asserting that the mean elevation of the surface of Europe was 1342 feet, and so on. Accordingly the doubles of Humboldt's figures have been adopted by Dr. Page in his "Advanced Text Book of Geography,"§ by Professor Geikie in his edition of Juke's Manual of Geology,¶ and by others. Nevertheless they are all wrong, having been led astray by Humboldt's obscure, I had almost said, incorrect, language. There is a note (No. 360) on the passage in *Cosmos* which, at least, most English readers seem to have overlooked, and which makes it quite clear that by the height of the centre of gravity of the

* See "Forty-fifth Annual Report of the Royal Institution of Cornwall," 1863, pp. 34-5.

† "Cosmos." By Alexander Von Humboldt. Sabine's Translation. 3rd ed. 1847, vol. i. p. 293.

‡ "Ency. Brit." 8th ed. 1859, vol. xvii. p. 590.

|| "Physical Geography," p. 118.

¶ See Edition of 1864, p. 66.

|| "The Student's Manual of Geology." By J. Beete Jukes. Third Edition. Edited by Archibald Geikie, F.R.S. 1872, p. 427.

land, Humboldt meant the mean height of the land. Hence, it is not a fact, even though Sir John Herschel says it is, that the mean height of Europe is 1342 English feet. The question is of great importance in all speculations in Physical Geography and Geology. For example, Professor Geikie says, "The mean height of the North American continent, according to Humboldt, is 1496 feet. Under the Mississippi rate of denudation, therefore, that continent would be worn away in about nine million years."* To convert this into a fact, there can be little doubt that in the next edition the Professor will modify the passage thus: "The mean height of the North American continent, according to Humboldt, is 748 feet. Under the Mississippi rate of denudation, therefore, that continent would be worn away in about 4·5 million years."

The haste with which ignorance finds an explanation for everything remarkable, the desire which too many of us have to rush into print, and the readiness with which editors of newspapers accept local paragraphs, will no doubt account for the circulation of many an error.

I was so fortunate a few years since as to assist at the strangulation of a strange mistake, which in all probability would otherwise have found its way into print, and, having got a start, would have been difficult to overtake. A note reached me from a gentleman, resident in Devonshire but an entire stranger to me, in which the writer said, "I have met with a mass of limestone in which is contained a skull, as the jaws and teeth and sockets of the eyes are clearly discernible. It has a very ape-like appearance, and whether human or semi-human, you no doubt could decide." During the exchange of a few letters, my correspondent made further "discoveries," and was at length so kind as to bring his specimens for my inspection. The box in which they were packed with a care appropriate to their supposed importance, contained, he said, the rich cargo of "three fossil human skulls and as many elephants' teeth." Having had my appetite thus whetted, I watched the process of unpacking with some impatience. At length the first "skull" was unravelled and proved to be simply a lump of limestone of such a form that those who are apt at seeing faces in the fire and other unusual places, might call it a "skull very ape-like," or anything else they chose. Not a word was spoken, however, until all the specimens lay exposed to view, and then I had to inform their

* Op. cit. p. 427.

owner that they were simply blocks of limestone having no claim whatever to be regarded as "skulls," or "elephants' teeth," or fossils of any kind. The task was a truly painful one, as my visitor was obviously very amiable, and had enjoyed but few opportunities of becoming acquainted with the truths of palæontology. Moreover, he believed that he had made a discovery of the greatest importance. Fortunately, I had by me a human skull and some fine elephants' teeth. These I produced, and, placing them beside the lumps of limestone, left them to tell their own story. After a pause, my visitor heaved a deep sigh, and then said, "I see I have made a great blunder. Good morning." I made every effort to induce him to remain for a chat, but could neither prevail on him to do so, nor to take his specimens, which he remarked were "worthless."

After he had left, I found a label on one of the stones, having on it two passages from Shakspere; the first of which was

"In this the antique and well-noted face
Of plain old form is much disfigured."
King John, Act iv., Scene 2.

The second was the well-known passage in the 4th Scene of the 3rd Act of Macbeth :—

"Thou hast no speculation in those eyes."

I could not but regard them as touching indications of the sincerity of my visitor, whom I have never seen or heard of since he left his specimens with me.

Every one must have read newspaper paragraphs to the effect that frogs and toads have been found alive in cavities in solid blocks of stone or coal. Were it not that the writers believed that the reptiles had not recently entered their cells through some crevice, that the prisons had accumulated round the prisoners, that, in short, the latter were older than the former, they probably would not have troubled the public with their narratives. It is not unlikely that in some cases the stories are told in perfectly good faith, and, indeed, in consequence of a large degree of that which is commonly termed "faith." I say "in some cases," because I know it to be necessary to exclude, at least, one instance—the frog which drew so large a crowd of visitors in the Great Exhibition in 1862, and which was said to have been found alive in a solid block of coal at a very great depth in (I think) Monmouthshire. The story of this frog was duly and circumstantially announced

in the newspapers some time before the exhibition opened. Full particulars were given respecting its discovery, the depth below the surface, the name and situation of the mine, and the address of the proprietor, as well as of his resident agent. I cut out one of these announcements, and sent it to the agent of the mine with the following queries :—

“ 1st. Are the statements contained in the enclosed cutting substantially correct ? ”

“ 2nd. Were you present when the frog was found ? ”

“ 3rd. Are you perfectly satisfied that there neither was, nor had recently been, a crevice leading from the surface to the cavity the frog occupied ? ”

With my queries was enclosed a stamped envelope with my address, which I have never seen since.

Though, when at the exhibition, I courageously declined to visit the frog, I never lost sight of the case, until it was publicly stated by the highest authority that this wretched story was from the beginning known to be a hoax, and was nothing more than a mode of advertising a coal pit.

But let us return to the general question, and, for the sake of simplicity, limit ourselves to the alleged occurrence of frogs and toads in coal. It is well known that many remains of reptiles have been found in the Coal, or, as geologists call it, the Carboniferous, formation ; but instead of being recent frogs, they are all relics of extinct forms. The species of the Batrachidæ belonging to the existing animal kingdom have left no fossil traces of their presence. To accept the current stories, therefore, would be to commit ourselves to the belief that frogs lived in the Carboniferous period ; that some of them were capable of a term of existence to be estimated, not in hundreds or thousands, but in millions of years ; that for them neither food nor air were essentials of life ; that of such of them as died in those early times, none were preserved in a fossil state ; and that none of the many Carboniferous reptiles whose fossilized remains are well known to us, possessed the same power of indefinite vitality.

If my memory serves me, the plot in Miss Edgeworth's “ Patronage ” turns on the following incident :—A knavish attempt was made to wrest an estate from the holder, on the ground of an alleged legal instrument showing it to be the property of the claimant. The deed, on being produced, was found to be in correct form, and left no doubt that, unless it could be proved a forgery, it would carry the estate with it. Those who witnessed the execution of the instrument swore to their handwriting, and one of them volunteered the in-

formation that a coin would be found under one of the seals. The opposing barrister at once broke the seal, and found not only the coin, but the fact that the date it bore was several years subsequent to that on the document. It proved too much, and the case collapsed.

This is paralleled by the frog in the lump of coal. The former is no doubt a medal of creation, but it had not been struck when the deed in which it was found was drawn. A living Denderpreton in the same place would have been less absurd. The palæontologist would at once admit that there was no anachronism, and that if the physiologist could accept the story he need not object to it. Indeed, a few years ago a story actually went the round of the papers to the effect that a Pterodactyle had been found alive in a block of Lias limestone. On exposure to the air, the old flying reptile of the Jurassic period is said to have "flapped its wings, and then died." Here was a story which, though no doubt far removed from the category of facts, did not outrage geological chronology. The Pterodactyle was a member of the Liassic fauna.

The duty of verification is not at all times easy of accomplishment. Some time ago I had occasion to allude in a paper to the great gale of November, 1824, so fearfully destructive of life and property, especially at Plymouth. At the time of this memorable storm, I was a sailor boy, and rode out the tempest in one of the branches of Plymouth harbour. Though the only damage we sustained was the loss of our bowsprit, the fact that it was my first winter at sea and my first great gale enabled it to produce an ineffaceable impression on my mind. I believed the date to be burnt in on my brain, and never doubted that the storm commenced on the evening of November 24th, and culminated early in the morning of the 25th. In order, however, to be accurate, I wrote to two friends at Plymouth, who perfectly remembered the storm, and had no doubt of their ability to determine the exact date.

The first reply informed me that "the great gale of November, 1824, commenced on the 24th and continued three days." This so far as the date was concerned agreed with my own belief, and had my second friend remained silent I should have taken no further pains in the matter. His reply, however, arrived in a few days, and stated that "the wind began to rise between nine and ten o'clock on the evening of the 23rd of November, and increased in violence until between two and three o'clock on the morning of the 24th, when the

gale reached its height. It then began to ease a little, and finally dropt almost suddenly at about half past three, with a fearful crash of thunder. By eleven o'clock the Sound was like a mill pond."

It will be seen that the foregoing accounts differ both as to the date and duration of the tempest. My belief is that neither of them is correct in the latter particular. Unless I am greatly in error, the gale did not last twenty-four hours, and I am confident that, instead of being "like a mill pond," the Sound was exposed to a very heavy swell for more than a week.

As the discordance of the replies had rendered the date uncertain, I requested a friend to consult such county newspapers as were filed in the Library of the Devon and Exeter Institution, and in a few days he sent me three paragraphs respecting the gale copied from "Trewman's Exeter Flying Post," of Thursday, November 25th, 1824.

The first stated that "the storm began Monday, November 22nd, 1824, at Exeter, early in the afternoon, and continued with little interruption for 24 hours."

The second, dated Plymouth, November 24th, 1824, recorded that "the wind last evening, at the south, increased to a hurricane, and continued with unabated violence during the night; and it being spring tide, the lowest parts of the town were inundated."

The writer of the third paragraph, dated Plymouth, November 23rd, 1824, said, "We have been visited with one of the most tremendous storms that ever was experienced here—perhaps the *most* violent. It began to blow hard yesterday at the turn of the tide, and continued increasing in violence the whole night."

Up to this point, five statements had come to hand, of which one made the gale begin on the 24th, two on the 23rd, and two on the 22nd, and to add to the amusing discordance, the three paragraphs from the same newspaper did not agree.

As the enquiry could not be allowed to stop here, I requested a friend to examine the local newspapers filed in the Cornwall County Library at Truro. He promptly forwarded extracts from the "Cornwall Gazette" of November 27th, 1824, descriptive of the storm and its ravages at Penzance, Falmouth, Fowey, and Polperro, in each of which it was stated to have begun on November 22nd.

At this stage I remembered that the Religious Tract Society had published a description of this very storm. On application at the dépôt, I readily obtained a copy of it, and found

that it made the storm begin on the 22nd. Beyond this I made no enquiry, being willing to accept the 22nd as the correct date, and to believe that respecting a great event whose progress I had painfully watched, I had for upwards of forty years unwaveringly held an opinion that was *not a fact*.

Ardent partizanship is, perhaps, scarcely compatible with the verifying spirit. It clutches at everything that can be used as an argument, and frequently contents itself with naming an authority for a statement, when the story should have been thoroughly sifted before being employed in an argument.

In 1867 I received from its author a pamphlet entitled "Notice of the Occurrence of Mammoth and other Animal Remains discovered under Limestone in a Bone Cave at Shandon, near Dungarvon in the county of Waterford. By Edward Brenan, Esq." It is a reprint, from the "Natural History Review" for October, 1859, of a paper "read at the Extra Meeting of the Royal Dublin Society, held on the evening of the 22nd of June, 1859."

The author's aim is to oppose the doctrine of the Antiquity of Man, which, on account of the discoveries made in Brixham Cavern the year before, had secured the attention of the scientific world. In an early part of his paper he asserts that "petrification is not necessarily a proof of extreme geological antiquity, or of deposition prior to the human period," and in illustration of these propositions, he makes the following statement:—"Some few years ago a basket of eggs was found near Winchester, at a depth of 40 feet in the solid chalk, the whole of which (basket and eggs) became soldered together into one mass of flint, owing to the process of silicification; and this interesting specimen is still preserved in the Museum of the Queenswood College, near Stockbridge, Hants, as I am informed in a letter lately received from the learned Principal, George Edmondson, Esq., who has kindly sent me a photograph of the fossil."

In a foot note the author remarks, "In a subsequent letter Mr. Edmondson informs me that the cementing matter is composed of carbonate of lime; but this difference does not affect the question."

The premises known as Queenswood College formerly belonged to a party of Socialists, of whom they were purchased by the late Mr. Edmondson, for the purpose of carrying on an Agricultural College. Being slightly acquainted with the

existing Principal of the establishment, I wrote, calling his attention to the foregoing statement, and asking to be favoured with any information he could give respecting it. In his reply he said that he had never seen the basket, as on the death of Mr. Edmondson, it had been removed by his daughter; that the Chemical lecturer in the College, a well-known man of science and Fellow of the Royal Society, recollects the specimen, and stated that it never struck him as anything particular, that it looked very much like the so-called petrifications from Carlsbad and Knaresbrough, and that he had never heard a word as to its having been found deep down in the chalk.

Mr. Edmondson's daughter, to whom I next applied, informed me that the basket of eggs was in her possession; that her father had gone to Queenswood in 1847, entering on the premises almost as they had been left by the Socialists about two years before; that in the library, amongst other things, was the "petrified basket," and with it (or afterwards added, she knew not which) a manuscript paper, which she sent me.

This paper was neither dated nor signed, and proved to be a transcript of an article in the "Penny Magazine," vol. viii., p. 463, from which I have drawn up the following brief statement, containing all that affects my argument:—

"In excavating the London and South Western Railway, near Winchester, there was found a basket of eggs. The precise locality or depth at which it was found has not been mentioned; but there is a rumour that it was found in the deep cutting behind the barracks or King's house, as it is termed, on the west side of Winchester, near the Romsey road; and that the depth at which it was found was between 30 and 40 feet, the pit in which it had been originally deposited, whether by design or accident no one can now determine, having been filled up with chalk. The eggs are three in number, rather larger than pullets' eggs of the present day. Two of them are entire, but one has been broken. Eggs and basket are now completely soldered into one mass so that they cannot be separated, and the whole has been converted, not into black flint like what is usually found in chalk, but into grey flint or chert as it is termed. This curious petrification is, or was lately, in the possession of Mr. Jackson, an apothecary in Romsey, who purchased it from a collection of such curiosities as are met with in excavating the chalk, and which generally consist of various animal remains obviously of marine origin. None of these are petrified, but consist of

the same matter as if they were in a recent state; whereas this basket, which has evidently been placed in the chalk long after its accumulation, when these other matters were embodied in it, is converted into a siliceous substance, approaching in appearance and consistency to those flints which are so abundant in the upper chalk.

"The little basket of eggs is important in showing that this conversion into flint can take place within a limited period, a period certainly shorter than that which is usually assigned for the duration of man upon earth.

"The skill of the ancient Britons in basket making appears to have been considerable, but we are not to suppose that the basket now under description is so old as the time of the Romans, because it is not likely that previous to their arrival, or even during the course of it, Winchester was so extensive as to have had wells, in one of which the basket is presumed to have been found, in the chalk so far to the westward of the present city. It is probable that the depositing of this basket was not later than the early part of the twelfth century. The date, however, at which it was deposited is a matter of inferior consequence, and the main point is the conversion of animal and vegetable substance into a consistency closely approaching to that of flint, from having been buried in the chalk for a period of years much within the range of human history."

Before discussing the bearing on the Antiquity of Man of the so-called petrified basket of eggs, it seems desirable to feel sure that the specimen formerly at Queenswood was the same as that once in the possession of Mr. Jackson of Romsey. The eggs in the latter we are told were three in number; in the former, as I learn from the present possessor, there are four. In the former the so-called petrification is said to have been the result of calcification, in the latter of silicification. The former discrepancy is the more remarkable from the fact that a figure of the specimen is given in the article in the "Penny Magazine," and but three eggs are represented in it.

On the whole, however, I incline to the opinion that it was the same basket in each case. There was a broken egg in each, and their alleged localities and positions are the same. It is obvious that the writer in the "Penny Magazine" wrote from memory or from hearsay. He could not have had the specimen before him as he was not certain whether or not it was still in the possession of Mr. Jackson.

Mr. Brenan brings the basket into court avowedly to show that "petrifaction is not necessarily a proof of extreme

geological antiquity." I am not aware that it has ever been asserted to be so. So far as I am acquainted with them, the facts which have so largely convinced the scientific world of the high antiquity of man have nothing whatever to do with the question of petrification or non-petrification.

We must not allow ourselves, however, to be imposed on by words. Both authors speak of the basket as being "petrified," whilst the chemical lecturer at Queenswood, an eminently competent authority, who had seen the specimen, regarded it as a Carlsbad or Knaresbrough incrustation merely.

On comparing the language used by the two writers, a firmness is observable about that of Mr. Brenan which is not so conspicuous in that of the earlier author. Whilst the latter meekly states that the precise locality or depth at which it was found has not been mentioned, but there is a rumour that the depth was between 30 and 40 feet, and opines that the locality was an ancient well; his successor, whilst referring to him, makes the most unqualified statement that it was found at a depth of forty feet in the solid chalk. This, however, is a trick common enough to advocates.

Let us next see what the article in the "Penny Magazine" is really worth. For the locality and depth the author's only authority is Rumour. He is incorrect both as to the number of the eggs, and the nature of the incrusting mineral matter. He traces the specimen back, not to the person who found it, but to the sale at which Mr. Jackson bought it, apparently in a miscellaneous lot. This certainly betokens neither a mind trained in the severities of scientific reasoning, nor a mineralogist whose opinion is of any value. Yet Mr. Brenan appears to think that this wretched story justifies him in saying that "it would appear that modern theoretical geology, how ingeniously contrived soever to avoid suspicion, can with propriety, after all, be merely esteemed as a HAUGHTY IGNORING of facts, such IGNORANCE becoming inexcusable, and even malignant, from its being voluntary."*

That it is at least very difficult to destroy an error which has once found a place in literature is well known and easily accounted for. An amusing case of the kind lately occurred within my own experience. There is in Kent's Cavern, Torquay, graved on a boss of stalagnite, the following inscription:—"Robert Hedges of Ireland, Feb 20, 1688." It is perfectly legible, and has attracted a good deal of attention. The late Rev. J. Mac Enery mentions it three times in his

* Op. cit.

Manuscript "Cavern Researches," written upwards of forty years ago. In one place he gives the name as "Robert Hodges,"* in a second as "John Hodgson,"† and in a third as "J. Hodges;‡ but never the correct form of "Robert Hedges." The first of these errors—Robert Hodges—has got the start of not only all the others, but of the real name also, by having been printed in Mr. Vivian's compilation from the "Researches," published in 1859. When Mr. Scott Moore was writing his "Pre-glacial Man," he applied to me for information respecting this inscription. I sent him Mac Enerly's account of it as given in Mr. Vivian's edition of "Cavern Researches," adding the remark that the correct name was not Hodges, but Hedges. Mr. Moore's work contains the following statement:—"Mr. Pengelly has kindly furnished me with a copy of the inscription, taken by the Rev. Mr. M'Enerly in 1825: 'Robert Hedges, of Ireland, February 20, 1868.' " He adds in a note, "Mr. Pengelly reads the name 'Hodges,'"|| thus converting my attempt to correct the error into one to perpetuate it.

Before taking leave of this inscription, I may call attention to a problem connected with it which apparently admits of no solution. It is well known that prior to 1752, the year, according to legal computation, began on March 25, but according to the common usage, on January 1st, as at present. In what year then did Robert Hedges visit Kent's Cavern? If he used the legal computation, he was there something more than three months after the 5th of November, 1688, when William III. landed at Brixham on the opposite side of Torbay; but if he followed the common reckoning his visit was made almost nine months before that event. According to our present mode of dating, Did he make his visit in 1688 or 1689?

To assert that the concurrent and independent testimony of credible and well-informed witnesses must be taken as evidence in any other than in a legal sense, is to assert much more, probably, than the present age is prepared to accept. Such a canon would compel us to yield credence to the existence of witchcraft, for example; for, whether regard be had to the character of the witnesses, the moral and mental characteristics as well as the experience of the judges, or the

* See "Trans. Devon. Assoc." vol. iii. 1869, pp. 275 and 459.

† Ibid. p. 314.

‡ Ibid. p. 459.

|| "Pre-glacial Man, and Geological Chronology." By J. Scott Moore, 1868, p. 78.

confessions of the accused, it must be admitted that in our law courts this existence has been established on the most unimpeachable evidence; yet it is surely not too much to assert that no educated person of the present day accepts it.

The following case, for which I can vouch, may serve to illustrate this. It will be found to be supported by both personal and circumstantial evidence:—Mr. *Hazelwood* of Torquay having a few years since to go to Dawlish, informed his wife that he should return by the train due at Torre Station at a certain hour, and suggested that she might with their two children walk up to meet him, which she agreed to do. On the return journey there was in the same carriage with him a gentleman who had known Mrs. *Hazelwood* for several years, and who knew her children also. It should be remarked that the family were in mourning, and that the children were a boy and girl, the former being the older. At Newton Station Mr. *Hazelwood* bought a newspaper, and was reading it during the remainder of the journey. He had, for the time, forgotten the arrangement made with his wife, and he states that he had certainly not spoken of it to any one. As the train drew near Torre Station, his companion said, “There’s Mrs. *Hazelwood* with your two children standing on the bank.” He at once looked in the direction indicated, and distinctly saw a party, which he had not the least doubt were his wife, and boy, and girl, standing on the hedge or bank which, under Chapel Hill, overlooks the railway. On leaving the station, instead of walking towards Torquay, “he went in the opposite direction, on the Newton road, to join them. On his way he met a man who had known Mrs. *Hazelwood* from her childhood, and who volunteered the remark, “You are going to join your wife and family, I suppose. They are just above here, standing on the hedge.” He proceeded to the spot, and to his surprise found the party had left and were no where to be seen. After some fruitless search he proceeded to his own house, and found his family just starting to meet him at the station, they having forgotten the hour at which the train was due. Notwithstanding the fact that three persons, who knew them well, were prepared to swear that they had seen Mrs. *Hazelwood* and her children at a particular spot, notwithstanding the further fact that this was just the spot where they had previously, and without the knowledge of two of the witnesses, agreed to be at the time, it was not a fact that Mrs. *Hazelwood* and her children had on that day been standing on the hedge overlooking the railway near the station at Torre.

The Venerable Bede, who died in 735, thus speaks of Ireland in his "Ecclesiastical History":—"No reptiles are found there, and no snake can live there; for, though often carried thither out of Britain, as soon as the ship comes near the shore, and the scent of the air reaches them, they die. On the contrary, all things in the island are good against poison. In short, we know that when some persons have been bitten by serpents, the scrapings of leaves of books that were brought out of Ireland, being put into water, and given them to drink have immediately expelled the spreading poison, and assuaged the swelling."*

Of the foregoing statements, it is said to be true that "no reptiles are found there;" it may be true also that "no snake can live there;" but beyond these it cannot be conceded that any of them are facts, even though the venerable historian introduces them with the significant words "we know."

It is perhaps, noteworthy, that Bede, who died more than two and a half centuries after St. Patrick, and, as we have just seen, mentioned the fact in the Natural History of Ireland with which legend has long connected the name of the apostle of that country, is silent respecting the legend itself. This silence implies that the story is of more recent origin, or that Bede was ignorant of it, or that he did not believe it, or that through envy he suppressed it. So diligent a collector of stories calculated to increase the credit of the clergy is not likely to have been ignorant of such a legend had it existed; his readers will not readily suspect him of the scepticism hinted at above; indeed, he who had no difficulty in believing in the virtue of "the scrapings of the leaves of books brought out of Ireland," is not likely to have objected to the story of St. Patrick and the snakes; and though it is true that he makes no mention of St. Patrick throughout his "History," it is eminently improbable that he could be envious of the achievements of a man who had been dead upwards of two centuries.

Every ornithologist is familiar with the "Bernicle Goose," and every marine zoologist with the "Duck Barnacle." The name in each case contains a fossil opinion,—a belief now exploded, but once held and vouched for by men of the highest culture, who had enjoyed and sedulously embraced opportunities for making themselves acquainted with the facts. The names were given because it was believed that the Goose

* The Venerable Bede's "Ecclesiastical History of England." Bohn's Ed. p. 7.

which bears the first was developed from the Cirreped which bears the second ; and if it be possible for the concurrent testimony of a large number of independent, unimpeachable, eminently competent witnesses to establish a statement, this belief has been most unquestionably established.

The first known phase of the story respecting the origin of this goose is, that certain trees, resembling willows, more particularly in Pomona, one of the Orkneys, produced at the ends of their branches small swelled balls, containing the embryo of a duck suspended by the bill, which, when ripe, fell off into the sea and took wing.

This story was attested by *Saxo Grammaticus*; a learned Dane of the 12th century, the author of a history of Denmark of great value ; by the learned J. C. Scaliger, who died 1558 ; by Sebastian Munster, a German Franciscan monk (1489–1552), author of several learned works, amongst them one of the first universal geographies of modern times ; by Conrad Gesner, an eminent Swiss scholar and naturalist (1516–1565) ; by Ulysses Aldrovand, a native of Bologna (1527–1605), the most celebrated naturalist of the 16th century, who gave a figure of the goose-tree, displaying the pendant fruit ; by Magnus Oláus, archdeacon of the Swedish Church, who died in 1568 ; by Leslie, Bishop of Clogher (1570–1671) ; and by J. Johnston the naturalist (1603–1675).

This early story, which, as we have seen, held its ground from the twelfth to the seventeenth century, was ultimately killed down by another given by Hector Boëce, the oldest Scotch historian (1465–1536). He denies that geese grow on trees by their bills, as some believe, but that, as his own researches and personal experience prove, they are first produced in the form of worms, in the substance of old trees or timber floating in the sea ; for such a tree, cast on shore in 1480, was brought to the laird, who ordered it to be sawn asunder, when there appeared a multitude of worms, throwing themselves out of sundry holes and bores of the tree ; some of them were rude, as they were new shapen ; some had both head, feet, and wings ; but they had no feathers ; some of them were perfect shapen fowls.

In this view he was supported by Turner (1520–1568), a physician, naturalist, and divine, and one of the earliest pioneers of Natural Science in Great Britain. "When," says he, "at a certain time an old ship, or a plank, or a pine mast rots in the sea, something like a little fungus at first makes its appearance, which at length puts on the manifest form of

birds, afterwards these are clothed with feathers, and at last become living and flying fowl."

A host of other authorities might be quoted, but as they are all surpassed by John Gerarde, who was born at Nantwich in 1545 and died about 1607, he may be fittingly selected to close the list. In his "Herbalist" he gives the following detailed statement:—"What our eyes have seen and hands have touched we shall declare. There is a small island in Lancashire, called the Pile of Foulders, wherein are found the broken pieces of old and bruised ships, some whereof have been cast thither by shipwracke, and also the trunks and bodies with the branches of old and rotten trees, cast up there likewise: wherein is found a certain spume, or froth, that in time breedeth into certayne shels, in shape like those of the muskle, but sharper pointed, and of a whitish colour; wherein is contained a thing in form like a lace of silke finely woven, as it were, together, of a whitish colour, one end whereof is fastened into the inside of the shell, even as the fish of oisters and muskles are; the other end is made fast into the belly of a rude mass or lumpe, which in time cometh to the shape and form of a bird: when it is perfectly formed the shell gapeth open, and the first thing that appeareth is the foresaid lace or string; next cometh the legs of the bird hanging out, and as it grows greater it openeth the shell by degrees, till at length it all comes forth and hangeth only by the bill: in short space after it cometh to full maturitie, and falleth into the sea, where it gathereth feathers and groweth to a fowl bigger than a mallard and less than a goose, having black legs or bill or beake, and feathers black and white, spotted in such manner as is our magpie, called in some places a pie annet, which the people of Lancashire call by no other name than a tree-goose; which place aforesaid, and all those parts adjoining, do so much abound therewith, that one of the best is bought for three pence. For the truth hereof, if any doubt, may it please them to repaire unto me, and I shall satisfie them by the testimonie of good witnesses."*

Gerard gives a figure illustrating his description.

I have often thought that every teller of "good things" must frequently be in a state of great apprehensiveness when relating some choice anecdote, epigram, or *bon mot*, lest some candid and kind friend should remark, "Oh ! that's a very old Joe ! It was first told of So and So."

* See "The Pictorial Museum of Animated Nature," vol. ii. p. 51.

For example; What British duke is there whose name is not connected with the following story ?

"Mother," said a boy, "I opened the gate for the duke to-day."

"Did you ? What did the duke give you ?"

"Nothing."

"What did you say to him ?"

"Nothing."

"Oh ! You should have said 'Your Grace.'"

"I will next time."

The wished-for "next time" presented itself in a few days, when the boy, true to his promise, said, as he held the gate for the duke to pass through, "For what I am going to receive, may the Lord make me truly thankful." The story adds that His Grace rewarded the pious lad with a crown piece.

Most of us have heard the story of the two Fellows of Trinity College, Cambridge, who, nettled that the Master, the late Dr. Whewell, always had the lion's share in every conversation, resolved to introduce some subject which should certainly be beyond the range of his reading. In order to this, they carefully got up an elaborate Encyclopedia article on Chinese music (or, as some say, chess), and, on the first suitable opportunity, introduced the subject as a topic of conversation. In a very few minutes they found some of their positions assailed by the omnivorous Master, and at once quoted the Encyclopedia against him. He replied, "Oh, yes, I wrote that article, but I have changed my opinion since." The story is probably so very characteristic that it ought to be true, and, no doubt, was made to fit; for a friend of mine assures me that he once put the question to Dr. Whewell, when he replied that he had heard the story several times, but that it was not a fact. Another friend states that notwithstanding the disavowal, he firmly believes the story, and that Dr. Whewell had forgotten the circumstance. This, however, enables us to ask, "Is it a fact that it is not a fact ?"

There formerly lived in a Cornish town, two ministers of religion, each having the same name, let us say "Jones," and each a Doctor of Divinity, but one a member of the Church of England, the other a Dissenter. It will be readily foreseen that letters and parcels frequently went to the wrong house. On one occasion, so runs the story, the clergyman of the Establishment received and opened a letter intended for the eye of his namesake only. Perceiving the error, he re-

closed the letter and sent it to him for whom it was intended, and with it the following laconic note :—"Sir, If you had not taken to yourself a title to which you have no claim this mistake would not have occurred. I am, &c." Some time after, the Nonconforming Doctor received a parcel, which proved to be a series of manuscript sermons intended for the Churchman. On detecting the mistake he forwarded the parcel to its destination, accompanied by the following note :—"Sir, If you had not entered an office for which you are apparently not qualified, this mistake could not have happened. I am, &c."

Having heard this story several times, I once availed myself of what seemed a satisfactory opportunity for ascertaining whether it were a fact. I was introduced to a brother of the dissenting Doctor, himself a Nonconformist minister, and asked him whether the story were a truth or a fiction. He replied that it was unquestionably and literally a fact. Thus endorsed, I had frequently told it until I was informed by a friend that he had often heard the same story of two Reverend Doctors, of the name of "Brown," we will suppose, who resided in the same town in Sussex.

It would be easy to enlarge this budget of untrustworthy statements which usually pass as facts, but probably enough has been said to show the necessity and duty of verification.

In conclusion, I may allude to the numerous slanders which, from time to time, appear in the public prints respecting many of our most eminent men. It is true they have generally been disposed of in the most satisfactory manner, and as soon as they have presented themselves; but it is also true that they follow one another so rapidly as to induce one to ask, Is it a Fact that the public pay no attention to the continued cry of "Wolf" ?

DEVONSHIRE TOKENS ISSUED IN THE SEVENTEENTH CENTURY.

BY H. S. GILL.

(Read at Exeter, July, 1872.)

THE local tokens so universally circulated in this kingdom about 200 years ago present to the student a very singular episode in the history of our national currency.

They were introduced by private enterprise, without the consent of the Government, to meet a pressing want of "small change," which had existed for a long period.

These tokens, chiefly copper, but sometimes brass, began to appear in London at the close of the reign of our ill-fated King Charles I., gradually spread from place to place during the Interregnum, and for twelve years after the Restoration, until at length they were issued in nearly every city, town, and important village in England, Wales, and Ireland. Scotland did not require them, having had for nearly two centuries a currency for small sums, made of the mixed metal called billon. More than 10,000 varieties of our local tokens are known to have been coined; the earliest date to be found on them is 1648, the latest 1672, in this country; and although never legally sanctioned, yet for just that quarter of a century they were allowed to circulate in their respective localities, each coin passing for a farthing, halfpenny, or penny, according to the value set upon them by the persons for whom they were struck; and scarcely any other small money being then obtainable, they supplied to the poorer classes, while they lasted, almost the only means of obtaining the cheaper necessities of life; but in 1672 Charles II. sent out a very stringent proclamation, forbidding the further use of them throughout the kingdom, and declaring that all offenders in that respect should be "chastised with exemplary severity." In England and Wales this order had the desired effect; but in Ireland there was then, as is often the case now, a bold and systematic breach of the law; for the

local tokens were still coined in Kinsale, Limerick, and other towns, at various dates after the order for their suppression had been issued. One of the latest struck was a Dublin halfpenny, dated 1679; but, as if to condone the offence, *that* had on the reverse, "Long live the King."

Before entering into further details about the local tokens, it may be well to state, as briefly as possible, the cause which led to their adoption as a currency. We begin to hear of the scarcity of the circulating medium so long ago as the reign of Edward I., who, to meet it, ordered, in 1279, a large coinage of silver halfpennies and farthings. The latter pieces had never been issued before, and the former by a very few monarchs; so that up to that time the interesting old silver penny had been almost the sole money of the country from the earliest days of the Saxon Heptarchy. One only of the seven kingdoms, Northumberland, had a brass currency, called stycas, two of which were equal in value to one farthing. Originally the silver penny weighed twenty-four grains Troy, or a *pennyweight*, as it is still called, so that twenty of them used to weigh an ounce, and 240 pennies were a pound (1 lb.) in weight, as well as a pound (£1) in value; but from the continually increasing value of silver, that weight was gradually lessened in successive reigns, until the penny became inconveniently small, those of Charles I. weighing only eight grains.

Notwithstanding the new coins circulated by the first Edward, the scarcity of small money continued during the next two reigns, when Edward III. increased the number of coins considerably. He first introduced the silver half-groat and groat, and in gold the florin, and the elegant "rose noble," with their sub-divisions. About that time large quantities of base-metal foreign coins were sent to England for circulation at the rate of two for a penny; they were then called by a variety of names, viz., Pollards, Brabants, &c., but are now known to numismatists by the general term, "black money." These were prohibited by a proclamation in the same reign.*

When Richard II. succeeded to the throne the same chronic complaint continued, and a petition was sent to the king, of which the following is an abstract:—

"The Commons (*i.e.*, the poorer classes) stated that certain weights for bread, and new measures for beer, such as the pottle and quart, were ordained by statute, and that the said Commons had no small money to pay for the new measures,

* See Ruding's "Coinage of Britain," vol. ii. page 141.

which was greatly injurious to them ; therefore they prayed that it would please the King and Council to command that halfpennies and farthings should be made to pay for little purchases, for God, and for works of charity, and that the victuallers throughout the realm should be charged to sell their victuals answerably to the size of the money."

" This was promised to be done as soon as the king could provide bullion for the purpose."*

It is very likely the promise *was* fulfilled, as the halfpennies of Richard II. are not so scarce as his pennies, whilst in all other reigns about that period the converse is the fact.

Akerman, in the introduction to his work on *London Tokens*, conjectures it was about this time that " Abbey pieces " were circulated as *money* ; whilst North supposes they were intended for the use of monks and pilgrims who travelled from one religious house to another, being, in fact, a kind of passport, without which a stranger would not be admitted or relieved.

It is difficult now to say which of these theories is correct ; but from the large numbers that have been found, and are still continually being exhumed in all parts of England, it is evident their circulation must have been very general.

The scarcity of small silver money kept increasing for another century, and when Henry VII. was on the throne leaden trade tokens began to appear, and were continued in several successive reigns. They were clandestinely made and issued by shopkeepers in London and other large towns, notwithstanding several enactments against them.

In the introduction to Burn's *Catalogue of the Beaufoy Cabinet of Tokens in the Guildhall Library, London*, p. xxxiii., there is an extract from the accompt-book of Nicholas Ball, " marketman " of Chudleigh, in this county, with the following entries referring to leaden tokens :—" January 25, 1562. Item : Paid for a nyron, with a prynnt, and for led and for smyting of my tokenes, iijs." Again, " February 24, 1562 : Paid for ij pownde of led, for tokenes, and for making the same, xxijd ; " and " February 23, 1564 : Paid for led, and for tokenes for ij years' paste, xvjd."

During the long reign of Elizabeth vigorous attempts were made to give her subjects sufficient small money, and two new silver coins were issued, value three halfpence, and three farthings ; being the first and last time pieces of that amount were passed current in England. Altogether there were eleven denominations of silver issued by her, from a crownpiece to

* Ruding's " Coinage of Britain," vol. ii. page 220.

a halfpenny, and some of the smaller coins were so nearly alike in size, that, to distinguish them, each alternate coin only had a date; the 6d., 3d., 1½d., ¾d. were dated; the 4d., 2d., 1d., ¼d. were not. But the time was now approaching when the necessary circulating medium of the lower values could no longer be confined to minute pieces of silver. The last silver farthings coined were those of Edward VI., which weighed only $2\frac{1}{4}$ grains, and were but three-eighths of an inch in diameter. Silver halfpennies continued to be coined down to the reign of Charles I., but they were so very thin and small as to be easily broken or lost.

It seems strange to us now that a less precious metal had not been used before, for the silver coins had been continually clipped by dishonest persons; and, moreover, specimens of that famous bronze money which had been so abundantly circulated for 400 years by the Romans during their stay in England must have been continually found at their various stations (as they are still), yet the various Governments of the period did not profit by their example. At length, in 1613, the same year that he abolished leaden tokens, James I. granted a patent right to John, Baron Harrington of Exton, Rutlandshire, to coin farthing tokens of copper. Great efforts were made to circulate them, and all magistrates were ordered to assist in doing so; but being very small and thin (weighing only nine grains), they soon became unpopular, and the people generally refused to take them.

Nor was there any improvement in this respect during his son's reign; for on his accession the exclusive privilege by letters patent of coining copper farthings was granted to the Dowager Duchess of Richmond, and a Sir Francis Crane, Knight, for the term of seventeen years. For this monopoly they were to pay to the King "a yearly rent of 100 marks (£66 13s. 4d.) of lawful money of England, and the patent was to cease if the half-yearly payment thereof was not made within twenty-eight days of the feast of St. John Baptist (June 24th), and the nativity of our Lord."

To encourage their distribution, the patentees agreed to deliver twenty-one shillings worth of farthings for every twenty shillings sterling; whilst, in order to make larger profits, they were coined so small as to be much under the intrinsic value of the money they passed for; hence great discontent arose, which was increased by the refusal of the patentees to recharge them.* At length, petitions with com-

* Mr. Boyne remarks in his preface, page viii.: "The issue of this patent was one of the many arbitrary acts . . . which tended to destroy the attach-

plaints were sent to Parliament, which, in 1644, made an order "decrying" the said farthings, and for above twenty years there were no more legalized copper coins issued in England. Four more years passed by, when, as before stated, about the time our unfortunate King Charles I. was sent to the scaffold, the private tokens began to appear. There are so few dated 1648, that some consider these were all struck between the King's death on January 30th and March 25th, until which time the date of the previous year was then retained. The tokens dated 1649 and 1650 are likewise scarce. We have none of Devonshire until 1651; but during the next decennial period they gradually became more numerous, although still confined to farthings. After the Restoration they increased abundantly, and then for the first time in this country halfpennies began to appear as a copper currency; whilst in London, and some other localities, pennies were struck and circulated; but we had none in Devon.

I may here state that an excellent work on the 17th century tokens was published in 1858 by W. Boyne, Esq., F.S.A., and to that source I am indebted for much information on the subject. In his book he gives a list and description of the Devonshire series, comprising 231 specimens; yet although so recently brought out, about seventy varieties of this county, not known to Mr. Boyne, have since been found. So far as can be ascertained up to this time, there were 301 different tokens issued in Devon; some of the counties near London had a larger number, but none of the more remote ones, Yorkshire alone excepted, had so many. Exeter furnished seventy-one, or nearly one-fourth of the whole, and this fact is a proof that our Western Metropolis was then in a flourishing condition. It may be interesting to compare our old city at that time with one of the largest centres of provincial population at the present day, namely, Liverpool, which had but seven issuers of local tokens; thus showing what two centuries have effected in altering their relative size and importance. The loss of the great staple trade of this county since then may have retarded the growth of Exeter, but Liverpool has certainly gone ahead with marvellous rapidity. Plymouth stands next to Exeter in the number of tokens issued—she sent out thirty; then comes Tiverton with twenty-three varieties, of which seven were halfpennies whilst Exeter had but one halfpenny. Our other towns were much below in point of numbers, as will be seen by the list.

ment of the people to the Royal Family." Out of above 10,000 tokens known to have been issued, the name of Charles appears only on 46.

Through the kind assistance of Messrs. Charles Golding and J. S. Smallfield, of London, who have devoted a great deal of time to the study of these tokens, and have each a collection of above 4,000 specimens, I shall be able to give as a supplement to this paper a detailed list of the Devonshire series, including all the recent additions (which have never yet appeared in print), together with the names of the issuers.

Many of these were large employers of manual labour, such as makers of serges and woollen goods, then called "Clothiers," who doubtless used the tokens in payment of wages; others were enterprising tradesmen, innkeepers, &c., and a goodly number were of the gentler sex. There were six females in Exeter who had these coins struck; probably strong-minded widows,* who were endeavouring by honest industry to support and bring up their fatherless children, as sensible English matrons still do. Such persons always did, and always will, find friends to help them. One was named "Judeth Hatchley," who lived "neare East Gate;" "Ann Powle, without West Gate." Another, "Elinor Rooke, in St. Sidwell parish;" "Grace Searelle, in South Gate Streete," and two others.

Some of the tokens were not dated, perhaps from want of space. They generally bore the name and initials of the person for whom they were struck; and when that of a male issuer had three initials, the second was that of his wife. It may here be noted that of the 10,000 seventeenth century tokens coined, no person, male or female, appears on them with more than one Christian name—a custom much departed from in these days;† but, as if to make up the deficiency, it was not uncommon in that and the previous century for a man to have two surnames. We have an instance in one of the former bishops of this diocese, who was named "John Harman, alias Voisey;" and at Tiverton there were two gentlemen whose double surnames have been handed down to us—one, a nephew of good old Peter Blundell, "Robert Comin, alias Chilcot," who founded the English free school there; the other, "Richard Hill, alias Spurway," was the first Mayor of Tiverton.

The tokens were often issued by the ruling authorities of

* A female issuer of Colebrook has "WIDOW HOMES" on her farthing (No. 40).

† Camden, in his "Remaines concerning Britain," page 49, remarks— "Two Christian names are rare in England, and I only remember now his Majesty, who was named Charles James, as the Prince, his son, Henry Frederic; and among private men, Thomas Maria Wingfield, and Sir Thomas Posthumus Hobby."

a city or borough, and are then called "town pieces." In Devonshire they were coined and circulated by Ashburton, Axminster, Bideford, Dartmouth, Moretonhampstead, and Torrington. The Ashburton token has on obverse, "AN . AYSH-BVRTON . HALFE . PENNY . 1670." On reverse, as is usual with town pieces, there are the arms of the borough. The Axminster one has on obverse, "A . FARTHING . FOR . AXMISTER" (*sic*); reverse, "AND . NO . OTHER . PLACE." Bideford and Dartmouth had each a halfpenny, as well as a farthing token. Moretonhampstead had two varieties, both halfpennies. On each is the legend, "FOR . Y^E . BENEFIT . OF . Y^E . POORE." One only is dated (1670), and has on obverse, "Y^E . 8 . MEN . & . FEEFFFEES . OF . MORETON." Who the eight men were it is difficult now to say.

In the adjoining shire of Somerset there were thirteen places which had town pieces—a larger number than in any other. Those of Chard, Langport, and Yeovil have on them, "Made . by . the . Portreeve ;" Ilchester, "By . y^e . Bayliff of y^e . Burrow ;" Taunton, "By the Constables." This token has an attempt at a rebus of the town upon it, viz., a tun with a large T reaching through it. (Punning devices of this kind are often to be met with.) Wellington has on it, "By the Overseers; for the benefit of the poore." That of Minehead has, "The poore's farthinge of Myneheade, 1668." Ilminster has simply on each side, "A Illmister farding!"

The neighbouring county of Dorset had eight town pieces, from which I select two examples. 1. "The Burrough of Blandford, their Corporation farthing for the vse of y^e poore, 1659." 2. "For the Maior of y^e town and countey of Poole, 1667.* That of Bridgenorth, Salop, has on it, "The Chamberlins of Bridgnorth, their halfpenny;" and Hereford, "Hen. Jones, Sword berer, Hereford Citty." It will be seen by the foregoing examples that the spelling on the tokens was very defective and irregular, and it is evident the engravers were often illiterate, and must have taken the names of places and persons orally, from local pronunciation, rather than from official documents.†

* In the Corporation books of Poole is this singular entry: "August 22, 1667, Moses Durrell, Maior, disbursed the sum of Ten Pounds for copper farthings, with the stamp of the town arms, and the inscription, 'For the Maior of y^e town and countey of Poole, and received in farthings (four to the penny) nineteen pounds, four shillings, to be passed in exchange betwixt man and man, as current money, until it shall be prohibited by his Majesty's order. If not prohibited, then the Maior shall transfer to his successor the sum of nine pounds, four shillings, in current monies, or in the same farthings."

† On many of the London tokens the spelling is still worse. On one there

The token for Aveton Gifford is spelt, as it is yet pronounced in the locality, "Awton Gifford;" one for Bradninch has on it, "Bradnedge," and Lympstone is spelt "Limson."

On the six Collumpton tokens the town is spelt four different ways, and not one of them is right. It is rather strange the orthography of this town is not yet fixed. The post-office authorities stamp all their letters "*Cullompton*;" the county magistrates and their clerk, at the divisional petty sessions, always spell it in the same way; so do the inhabitants generally; whilst in *Johnston's Gazetteer*, in the *Clergy List*, and on the great boards at the railway station, the two first vowels change places, and it is spelt "*Collumpton*."

In some counties the tokens were made of various shapes; not only circular, but octagonal, square, diamond, and heart shape. In Devonshire they were all round.

The Incorporated Trades' Companies were well represented in this county, as we have the arms of no less than sixteen of them amongst our tokens; viz., those of the Apothecaries, Barber Surgeons, Blacksmiths, Clothworkers, Coopers, Cordwainers, Drapers, Glaziers, Grocers, Haberdashers, Ironmongers, Mercers, Pewterers, Salters, Tallow Chandlers, and Weavers. A few of our issuers exhibit their own armorial bearings for a device, namely, Thomas Potter, of Modbury; William Furneaux, of Newton Abbot; John Shebbeare, of Okehampton; John Cooke, Roger Oliver, and William Tom, all of Plymouth. The last named gentleman was mayor of that borough in 1677.

The following had what are called "punning devices" on their tokens:—Edward Burd, of Colyton, had one of the feathered tribe on his; James Daggery, North Tawton, had a dagger; William Diaman, Tiverton, had three diamonds; Samuel Badcock, Southmolton, and James Cockey, Totnes, had each what our American cousins call a rooster; John Crosse, Totnes, had a cross; and Ralph Harbottle, Torrington, had the rebus of a bottle on a hare. It will be seen by some of the tokens that fashion as well as history "repeats itself." Jacob Irish, Crediton, and Henry Tanner, Honiton, have each a man's low-crowned hat, with a feather; and we know that some fast young men now-a-days wear feathers in their hats. Another issuer gives a boot, with the same absurdly high heel as is worn by the ladies at the present time.

We have in our series the signs of many inns and public-houses represented; viz., the Angel, Bear, Bell, Castle, Cock, are two shovels crossed, with the legend, "The cros shufles;" another has "Olfa tre" for olive tree.

Dolphin, Dragon, Globe, Goat, Hart, Hoop, Lion, Mermaid, St. George and Dragon, Ship, Star, Sun, Tankard, Three Cranes, Three Stags, Turk's Head, White (?) Ball, and Wild Boar.

But it was not only inns that had signs in those days. We know by our old books that printers of the period had them, and these coins inform us that many other tradesmen mounted a sign. There are two instances in our county series; viz., Benjamin Massey, of Colyton, mercer, had an anchor; John Guy, of Colebrook, chandler, displayed a cock. In London tradesmen's signs were very frequent. I have a token in my collection of "John Radbvrne, Grocer, at y^e Soldier in St. John Street."

None of our farthings, except the Bideford and Dartmouth town pieces, had their value impressed upon them; but every halfpenny had; the latter part of the word being spelt generally with one N; and it is rather remarkable, the same antiquated style of spelling is still retained in all our Books of Common Prayer printed at the Oxford University Press, even to the latest editions, containing the new lectionary. The word *peny* occurs in the gospels for Septuagesima Sunday, the fourth Sunday in Lent, and the twenty-third Sunday after Trinity.

Some of the legends on the tokens of other counties are curious, but only a few on our own deserve special notice. Three of the Exeter ones have on them, "For necessary change." A curious unpublished halfpenny of Edward Broad, Southmolton, has this quaint rhyme:

"When you please,
Ile chainge these."

John Hart, of Nottingham, chandler, has the same promise in another form :

"Take these that wil,
Ile chaing them still."

The Litchfield town piece states :

"To supply the poore's need
Is charity indeed."

John Twigden, of Northampton, has on his, "Crede, sed cave" (believe, but take care); as if to say, you may believe, or be sure this coin is genuine, but take care of others. Anthony Search, of Tenbury, asserts, "Plaine dealing is best." Richard Ambler, of Bishop's Castle, apothecary, has a square token, with the words "square dealing" upon it. One William Hall (who does not give the town he lived in) has "Paines brings gaines." We find occasionally loyal sentiments; but

they are all after the Restoration. "Richard Lucas, of Wickham" (Wycombe), asserts he would be "rather dead than disloyal." One "John Covlton" (it is not stated where he lived) has on his, "God save the King." Another token, without name of issuer or town, has on it, O : "Touch not mine annoynted"—King's bust, bare-headed, C. R.—R. "Feare God, Honor the King"—A Bible, 1660, between W. S. and I. N. Many of those who struck tokens at Exeter, Plymouth, and Tiverton, filled important public offices, as will be seen by the list. There were "men of mark" too in other counties amongst the issuers. "Joseph Sayer" states he was "Rector of Newbery" (Newbury). "Anthony Williamson," of Liverpool, was "Alderman." Henry Chapman (residence not given) styles himself "qvondam Esquire." Perhaps he acquired that title during the Commonwealth, and was deprived of it at the Restoration; but we cannot verify this conjecture, as his token is not dated. The letters J and U are never found on any of the tokens, but I and V always supply their places; thus each of the latter serves for two letters, and therefore is sometimes a vowel, sometimes a consonant. A curious mediæval token in my collection has the alphabet of the period on one side, but J and U are both wanting. On the obverse is a quaint figure of a schoolmaster sitting at a table, with an abacus and counters before him.

We do not know how far our tokens circulated out of their own locality, but probably, like the five-pound notes of a private banker in the present day, they would pass as money in any neighbouring place where their owners were known; for unlike the patent farthings of Charles I., they could always be converted into cash by applying to the issuer.

Tokens of several surrounding places have been found in Exeter,* and recently a Collumpton farthing was dug up in Tiverton churchyard.

We remarked at the commencement of this paper that the local tokens were peremptorily "put down" in 1672, and about the same time Charles II. coined a large quantity of copper halfpence and farthings, sufficient to supply the whole kingdom, with the same well-known type that has been used ever since, viz., the Monarch's head on the obverse, and the graceful figure of Britannia on the reverse. These new coins being of the full intrinsic value for which they were uttered (one of the farthings weighing down nine of Charles I.), quickly superseded the private tokens, which from that time have been confined to the cabinets of the curious.

* See Captain Short's "Collectanea curiosa Antiqua Dunmonia," p. 80.

Although ranking rather low as works of art, learned institutions and influential public bodies have not thought it beneath them to acquire large collections of the local tokens; for they are to be found in many county museums; and the Bodleian Library, Oxford, contains about twelve hundred specimens; whilst the Corporation Library in the Guildhall, London, has the Beaufoy collection of above thirteen hundred varieties, comprising only those tokens which had been issued in the metropolis. The British Museum possesses more than five thousand, which is probably the largest collection in the kingdom.

In conclusion, the seventeenth century local tokens are certainly an interesting memento of that period, and as they are gradually getting into fewer hands, are more eagerly sought for by numismatists; and their value as relics of the past is increasing year by year.

LIST OF THE TOKENS AND ISSUERS OF DEVONSHIRE.

Those marked * have not been published before.

APPLEDORE.

1. *O. PHILLIP. COMMAN* — A harp.

R. OF. APELLDORE. (16)64 — P. C

‡

2. *O. PHILLIP. COMMAN* — A harp.

R. OF. APELLDORE. (16)68 — P. H. C

‡

From this addition to the initials, it appears that P. C. had married since his first token was sent out.

3. *O. THO. GRIBBLE* — A ship.

R. OF APELLDORR — T. G

‡

The above three tokens were assigned by Mr. Boyne to Appledore, Co. Kent; but Comman and Gribble being both Devonshire names, I have included them in our County Series.—H. S. G

ASHBURTON.

4. *O. AN. AYSHBURTON. HALFE. PENNY. 1670* (in six lines).

R. (No legend) — A church, sun, crescent, a teasel, and a saltire (the arms of Ashburton). (See plate, No. 1.)

‡

- *5. *O. WALTER. FVRNACE. OF* — HIS HALFE PENNY

R. ASHBURTON. 1668 — WF conjoined

‡

This token, recently found at Chagford, was probably issued by a member of the Furneaux family, always pronounced Furnace, who carried on the woollen trade here for many generations.—H. S. G.

6. *O. ROBERT. IFFRAY* — B. G. I

R. OF. ASHBURTON. 1668 — HIS. HALFEPENNY

‡

7. A variety of No. 6 has the Queen's head in place of B. G. I

- *8. *O. MOSES. TOZER* — M. T

R. IN. ASHBURTON — M. T

‡



ASHBURTON.



AXMINSTER.



BIDEFORD.



CHUMLEIGH.



DARTMOUTH.



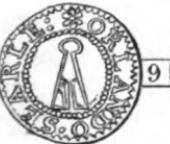
EXETER.



EXETER.



EXETER.



HONITON.



MORETON.



SOUTH TAWTON &c.



SOUTH MOLTON.



TIVERTON.



TIVERTON.

AVETON GIFFORD.

9. *O. THOMAS. MARTIN — 1659*
R. OF. AWTON. GIFFORD — T. S. M

AXMINSTER.

10. *O. A. FARTHING. FOR. AXMISTER — A pot of lilies.*
R. AND. NO. OTHER. PLACE — T. W. (See plate, No. 2.)
11. *O. THOMAS. WHITTY. IN — A stick of candles.*
R. AXMINSTER. MERCER — T. D. W

BAMPTON.

- *12. *O. HENRY. BALL. IN — The Clothworkers' arms.*
R. BAMPTON. 1666 — H. E. B
- *13. *O. HENRY. BALL — H. H. B*
R. IN. BAMPTON — Three balls.
- *14. *O. IOHN. BALL — The Grocers' Arms.*
R. OF. BAMPTON. 1652 — I. B
15. *O. DANIELL. GLAS. IN. BAMPTON — The Mercers' Arms.*
R. IN. DEVONSHEIRE. 1666 — HIS HALF PENY
16. *O. WILLIAM. YEANDEL — The Cordwainers' Arms.*
R. OF. BAMPTON. 1669 — HIS. HALF. PENY. W. A. Y

BARNSTAPLE.

- *17. *O. IONAS. HAWKSWELL — The Weavers' Arms.*
R. OF. BARNSTAPLE. (16)68 — I. K. H
18. *O. WILLIAM. HILL. IN — A castle*
R. BARNISTABLE. 1656 — W. H
19. *O. PHILIP. SOMERS. OF — A star.*
R. BARNSTAPLE. 1662 — P. G. S
20. *O. NATHANIEL. SYMONS — A trefoil.*
R. BARNSTAPLE. 1657 — N. S
21. *O. IOHN. WEBBER. OF — A tankard.*
R. BARNESTABLE. 1666 — I. W
22. *O. RICHARD. WEBER. IN — The Pewterers' Arms.*
R. BARNESTABLE. 1667 — R. W

BIDEFORD.

23. *O. THE. ARMES. OF. BIDEFORD — A ship under a bridge.*
R. A. BIDEFORD. FARTHING — B. C. 1659.
- (B. C. stands for Bideford Corporation.)
24. *O. THE. ARMES. OF. BIDEFORD — A ship under a bridge.*
R. A. BIDEFORD. HALFE. PENY — B. C. 1670 (See plate, No. 3.)
25. *O. HENRY. BRAYERLE — H. B*
R. OF. BIDDEFORD — 1663
26. *O. GEORGE. DAVIS. OF — The Barber-Surgeons' Arms.*
R. BIDEFORD. 1668 — G. D
27. *O. IOSIAS. ELLIOT. OF — A double triangle.*
R. BIDEFORD. IN. DEVON — I. E

28. *O. THOMAS. LEACH — T. L.
R. OF. BIDDEFORD — 1657*

BISHOP'S TEIGNTON.

29. *O. JOHN GRANTE. 1670 — HIS HALFE PENY
R. OF BISHOPS. STANTON — I. E. G*

BRADNINCH.

- *30. *O. THOMAS. PEARCE. OF — T.P. conjoined.
R. BRADNINCH. MERCE^a — 1658*
31. *O. HENRY. RICHARDS — HIS HALF. PENY
R. IN. BRADNEDGE. 1666 — The Cordwainer's Arms.*

BRIDGETOWN (near Totnes).

32. *O. WILLIAM. BRADFORD. AT. THE — A wild boar.
R. IN. BRIDGTON. HIS. HALF. PENY — W. E. B*
33. *O. JAMES. CHED. OF — A hand.
R. BRIDGTON. 1659 — I. M. C*

CHUMLEIGH.

- *34. *O. JOHN. BOWRING. OF — HIS HALFE PENY. I. M. B
R. CHULMLEIGH. 1670 — A woolcomb. (See plate, No. 4.)*
The issuer of this token was an ancestor of Sir John Bowring, and his coin is an interesting memento of the woollen trade formerly carried on in this county.
35. *O. ALICE. MOORE. OF — A bell.
R. CHVILMELEY. 1668 — HER HALF PENY*
36. *O. JAMES SHEPPARD. 1669 — A malt shovel.
R. IN. CHVLMLY. MALSTER — HIS HALFE PENNY*

COLEBROOK.

37. *O. THOMAS. BVRCOMBE — A hart.
R. IN. COLEBROOKE — T. D. B*
38. *O. IOHN. FORISE. AT. Y^a — A bear passant.
R. IN COVLBROVGH. 1667 — I. S. F*
39. *O. IOHN. GYV. CHANDLER — A cock.
R. IN COVLBROKE. 1652 — I. B. G*
40. *O. WIDOW. HOMES. AT. Y^a — A ball.
R. IN COALBVCK — S. H*
41. *O. IOHN. HOSEY. AT. THE — An angel.
R. ANGELL. IN. COLEBROOK — I. I. H*
42. *O. SAMVELL. MILLS — A turkey.
R. IN. COLEBROOKE. (16)57 — S. M. M*
43. *O. EDMVND. SLOCOMBE — Three stags.
R. IN. COLEBROOKE. 1653 — E. D. S*
Probably these do not all belong to Devonshire, as there is a Colnbrook in Bucks, formerly called Colebrook.

COLLUMPTON.

44. *O. WALTER. CHALLS. OF — A rose.
R. CVLLVMSTON. 1651 — W. S. C*

45. *O. TRVSTRAM . CLARKE* — A man making candles.
R. IN . COLLOMTON — T. A. C. $\frac{1}{4}$
46. *O. IOHN . HARRIS . IN* — HIS . HALFE PENNY
R. CVLLEMTON . 1666 — I. M. H. $\frac{1}{2}$
47. *O. HENRY . HOPPING . CARRIER . IN* — A pack horse. 1666
R. CVLLVMPTON . HIS . HALF . PENY — H. D. H. $\frac{1}{2}$
48. *O. IOHN . MUDFORD . 1667* — A woolpack.
R. IN . CVLLVMPTON . HIS . HALF PENY — I. M. M. $\frac{1}{2}$
49. *O. WILLIAM . SKINNER* — Three fleurs-de-lys.
R. OF . CVLLVMSTON — W. S. S. $\frac{1}{2}$

COLYTON.

50. *O. EDWARD . BVRD . OF* — A bird. 1657
R. CVLLITON . DEVON — E. M. B. $\frac{1}{2}$
51. *O. BENJAMIN . MASSEY* — An anchor.
R. OF . CVLLITON . MERCER — B. M. $\frac{1}{2}$
52. *O. IN . COLATEN . 1659* — N. E. P.
R. (No legend) — A rose within a border.
From the initials, this was doubtless N. Parkman's. $\frac{1}{2}$
*53. *O. NATHANIEL . PARKMAN* — A full blown rose.
R. IN . CVLLETON . 1666 — N. E. P. $\frac{1}{2}$
54. *O. NATHANIEL . PARKMAN* — A full blown rose.
R. IN CVLLITON . 1668 — HIS HALF PENY $\frac{1}{2}$
55. *O. NATHANIELL . SWEET* — An anchor.
R. OF CVLLITON . 1657 — N. S. $\frac{1}{2}$

CREDITON.

56. *O. NICHOLAS . BODLEY* — A pair of scales.
R. OF . CREDITON . 1668 — N. H. B. $\frac{1}{2}$
57. *O. WILLIAM . DANIELL* — A sheep.
R. IN . CREADITON . 1664 — W. M. D. $\frac{1}{2}$
58. *O. IACOB . IRISH . OF* — A hat and feather.
R. CREDITON . ROB(E) TAILLER — HIS HALF PENY $\frac{1}{2}$
*59. *O. IOHN . KNIGHT* — A shuttle.
R. IN . CREDITON . 1665 — I. S. K. $\frac{1}{2}$
60. *O. GILBERT . NICOAIS . 1665* — A pail.
R. OF . CREDITON . IN . SANDFORD — G. M. N. $\frac{1}{2}$
G. N issued another farthing in 1660, at Sandford, a village near Crediton. See No. 231.

CULMSTOCK.

61. *O. IOHN . DAVY . OF* — A merchant's mark.
R. CVLMESTOCK . DEVON — I. M. D. $\frac{1}{2}$
62. *O. EDWARD . LANE . IN* — A woolpack.
R. CVLLVMSTOCKE . 1654 — E. F. L. $\frac{1}{2}$
63. *O. RICHARD SHVTT* — R. S.
R. OF . CVLMESTOCK — 1654 $\frac{1}{2}$
*64. *O. IOHN . SOVTHWOOD* — The Mercers' Arms.
R. OF . CVLMSTOCK . 1657 — I. I. S. $\frac{1}{2}$

DARTMOUTH.

65. *O. A. DARTMOUTh. HALFE. PENY* — (In five lines across the field.) (See plate, No. 5.) ‡
R. A King with sceptre, seated in an antique ship.
66. *O. A. DARTMOUTh. FARTHING* (In five lines across the field.) ‡
R. Same device as the last.
67. *O. ROBERT. BIFFEN* — A globe. ‡
R. IN. DARTMOUTh. 1663 — R. B. B ‡
- *68. *O. HENRY. BVRD.* 1664 — A rose with stem. ‡
R. IN. DARTMOUTh — R. S. B ‡
 I am indebted to Mr. Henry Christie, of London, for this hitherto unpublished token. H. S. G.
69. *O. PHILLIP. CARY* — The Apothecaries' Arms. ‡
R. IN. DARTMOUTh. 1663 — P. C ‡
70. *O. HENRY HVNT* — 1669 ‡
R. OF. DARTMOUTh — H. D. H ‡
71. *O. EDMVN. IEFFRIE* — E. E. I ‡
R. IN. DARTMOUTh — 1657 ‡
72. *O. EDMOND. IEFFRIE* — E. A. I ‡
R. OF. DARTMOUTh. 1668 — E. A. I ‡
73. *O. THOMAZIN. SIKES* — The Grocers' Arms. ‡
R. IN. DARTMOUTh. 1652 — T. S ‡

EXETER.

- *74. *O. AT. ST. MARTIN's (GATE)* — I. B ‡
R. IN (DETРИTED). (16)64 — EXON ‡
75. *O. HENRY. AXWORTH. FOR* — EXON ‡
R. NECESARY. CHAING — XTER ‡
- *76. *O. IOHN. BARKER.* — An Indian with bow and arrow. ‡
R. IN. EXON. 1663 — I. V. B ‡
77. *O. FRANCIS. BASS* — (DETРИTED) ‡
R. IN. EXON. 1665 — F. C. B ‡
78. *O. IOHN. BENNET.* — I. S. B. ‡
R. OF. EXON — I. S. B. 1657 ‡
79. *O. WILLIAM. BENNET* — EXON ‡
R. OF. EXON. 1668 — W. T. B ‡
80. *O. ABISHA. BROCAS. IN* — EXON ‡
R. BOOKSELLER — A book. ‡
 Abisha Brocas was Steward of the Corporation in 1672.
81. *O. ACHIER. BROCAS* — A Turk's head. ‡
R. IN. EXON. 1670 — A coffee pot. ‡
82. *O. IOHN. BVRELL. GROCER* — I. B ‡
R. IN. EXON. 1671 — 1671 ‡
 Burell was Sheriff of the City in 1692, and Mayor 1698.
83. *O. SAMVELL. CALLE* — A man smoking. (See plate, No. 7.) ‡
R. GOVLDSMITH. IN. EXON — A covered cup. ‡
 Samuel Calle was Steward of the Corporation in 1667.
- *84. *O. IOHN CANTER* — A fleur-de-lys. ‡
R. IN. EXON. 1666 — I. C ‡

85. *O.* I. CHALWELL — 1660.
R. IN EXON — I. C. †
- *86. *O.* IOHN. CHALWELL — 1662
R. IN. EXON — I. C. †
- John Chalwell was Steward of the Corporation in 1670. He was Sheriff in 1682. Alderman in 1684, and Mayor in 1701.
87. *O.* IOHN. COGAN. IN. (16)64 — EXON
R. AT. ST. MARTIN'S. GATE — I. B. C †
88. *O.* JOHN. COLLIBEER — The Weavers' Arms.
R. IN. EXON. 1666 — I. A. C †
89. *O.* WILL. COPLESTON — The Grocers' Arms.
R. IN. EXON. 1668. — W. P. C conjoined. †
90. *O.* IOHN. DAGGE — A lion passant gardant.
R. OF. EXON. 1653 — I. A. D †
91. *O.* IOHN. DANNIEL. OF — EXON
R. EXON — 1664 †
92. *O.* IOHN. DVNNING — A man smoking.
R. OF. EXON. 1668 — I. S. D †
93. *O.* THOMAS. FORWARD — Three keys.
R. OF. EXON. 1668 — T. E. F †
94. *O.* ROBERT. FOSTER. — A shuttle.
R. OF. EXON. 1668 — R. M. F
 Robert Foster was Steward of the Corporation, 1686. †
95. *O.* RICHARD. FREKE — The Grocers' Arms.
R. IN. EXETER. 1659 — R. M. F †
96. *O.* THOMAS GILBERT — T. G
R. OF. THE. CITY. OF. EXON — 1666 †
97. *O.* ANDREW. GLANFEILD — A man making candles.
R. OF. EXON. 1668 — A. I. G †
98. *O.* THO. GLOYNE. IROMON — The Ironmongers' Arms.
R. GER. IN. EXETER. 1657 — T. G †
99. *O.* RICHARD GOSWELL — R. G
R. IN. EXON. 1668 — EXON. †
100. *O.* AT. THE. CITY. OF — I. S. H
R. EXETER. 1658 — A bell. †
101. *O.* IVDETH. HATCHLEY. IN — I. H
R. EXON. NEARE. EASTGATE — I. H †
- *102. *O.* EDWARD. HICKMAN — The Ironmongers' Arms.
R. IN. EXETER. 1659 — E. H
 He was Steward of the Corporation in 1670. †
103. *O.* MICHAELL. HIDE. IN. EXON — A book and harp.
R. BOOKSELLER. 1670 — M. H †
104. *O.* THOMAS. HITCHE — A roll of tobacco.
R. ON. EXBRIDGE — T. E. H †

The village of Exebridge, to which Mr. Boyne assigned this token, is but a small hamlet, belonging to the parish of Morebath, with scarcely a shop, and no manufactory in it; whilst it is well known that before the present bridge at Exeter was built in 1770, the previous one had

houses upon it, overhanging the river; and from the word "*on*" Exbridge, used by "Thomas Hitche," I believe this token certainly belongs to the old city.—H. S. G.

105. *O. MARTIN . HOPKINS* — A man holding pair of scales.

R. IN . EXON . 1666 — M. A. H

Of this family was Ezekiel Hopkins, Bishop of Londonderry, a native of Sandford.

106. *O. HENRY . HVGH* — H. H

R. OF . EXON — 1662.

- *107. *O. ROGGER . HVMPHREY* — R. H

R. IN . EXON . 1663 — P surmounted by a crown.

108. *O. PHILLIP . IERMAN* — 1668

R. GROCER . IN — EXON

- *109. *O. THOMAS . IONES* — A man smoking.

R. OF . EXETER . 1669 — EXON

110. *O. WILLIAM . IOHNS . AT* — The sun.

R. THE . SUNN . IN . EXON — W. P. I

111. *O. WILLIAM . KEAGLEY* — A fleur-de-lys.

R. IN . EXON . 1664 — W. M. K

112. *O. IOHN . LEDGINGHAM* — Two Vs, one inverted on the other.

R. OF . EXETER . 1660 . — I. L conjoined.

113. *O. RICHARD . LVNN* — A comb.

R. IN . EXON . 1664 — R. L

114. *O. IOHN . MATHEW . — 1662*

R. IN . EXON — I. M

115. *O. WILLIAM . MAY* — A lantern.

R. IN . EXON — 1663

- *116. *O. JOSEPH . MAYOTT* — The Grocers' Arms.

R. OF . EXETER . 1657 — I. M. conjoined.

- *117. *O. MARY . MOORE . 1657 — EXON*

R. DRINK . YEE . ALL . OF . THIS — A communion cup.

This is a curious leaden token, $\frac{1}{4}$ size.

118. *O. MARIE . MVENTJOY* — The Mercers' Arms.

R. IN . EXON . 1666 — M. M

- *119. *O. NECESARY . CHANGE* — P-P joined.

R. IN . EXON . 1671 (In three lines across the field.)

- *120. *O. Y*. RED . LYON . NEAR . EXON* — A lion rampant.

R. FOR . NESSESSARY . CHANGE — $\frac{1}{2}$ d. (See plate, No. 6.)

This is the only halfpenny known to have been issued in Exeter. I am indebted to the kindness of Charles Golding, Esq., of Paddington, for the loan of this very rare, if not *unique*, token, together with several others, for the purpose of engraving them on the plate which accompanies this paper.—H. S. G.

121. *O. THOMAS . PAFFORD . — The Mercers' Arms.*

R. OF . EXON . 1668 — T. L. P

122. *O. AMBROSE . PAIGE . 1658 — A castle.*

R. OF . EXON . 1658 — XON

123. *O. CHRISTOPHER . PAINE — 1666*

R. OF . EXON . DYER — C. P

124.	<i>O. HENRY. PALMER — EXON</i>	
	<i>R. EXISTER — A dagger erect.</i>	‡
125.	<i>O. JOHN. PALLMER. IN — The Mercers' Arms.</i>	‡
	<i>R. EXON. MERCER. 1667 — I. M. P.</i>	‡
*126.	<i>O. JOHN. PEARCE — The Haberdashers' Arms.</i>	
	<i>R. IN. EXON. 1663 — I. P.</i>	‡
*127.	<i>O. WILLIAM. PEARCE. IVNIOR — A fleur-de-lys.</i>	‡
	<i>R. OF EXON. 1668 — W. M. P.</i>	‡
128.	<i>O. ROBERT. PENN. 1658 — A stick of candles.</i>	‡
	<i>R. CHANDLER. IN. EXETER — R. E. P.</i>	‡
129.	<i>O. ANTHONY. POTTER — A pair of scales.</i>	
	<i>R. IN. EXON. 1664 — A. P.</i>	‡
130.	<i>O. GRACE. POTTLE — G. P.</i>	
	<i>R. OF. EXON. 1665 — G. P.</i>	‡
131.	<i>O. ANN. POWLE. WITHOVT — A three-leg'd pot.†</i>	‡
	<i>R. WEST. GATE. IN. EXON — 1666</i>	‡
132.	<i>O.IASPER. RADCLIFF — A castle.</i>	
	<i>R. OF. EXON. 1659 — I. M. R.</i>	‡
133.	<i>O. NICHOLAS. REDWOOD — The Ironmongers' Arms.</i>	
	<i>R. OF. EXON. 1651 — N. R.</i>	‡
134.	<i>O. ELINOR. ROOPE. IN — 1669. (See Plate, No. 8.)</i>	
	<i>R. ST. SIDWELL. PARISH — EXON</i>	‡
135.	<i>O. JOHN. RVSSELL — I. G. R.</i>	
	<i>R. IN. EXON. 1669 — (In three lines across the field.)</i>	‡
136.	<i>O. JOHN. SAVNDERS — The Blacksmiths' Arms.</i>	
	<i>R. OF. EXON. 1668 — I. S.</i>	‡
137.	<i>O. GRACE. SEARELLE. IN. SOVTH — G. S.</i>	
	<i>R. GATE. STREETE. IN. EXON — G. S.</i>	‡
138.	<i>O. JAMES. SLADE — The Clothworkers' Arms.</i>	
	<i>R. OF. EXON. 1666 — I. 3</i>	‡
	James Slade was Sheriff of the City in 1666.	
*139.	<i>O. JOHN. SLADE — 1658</i>	
	<i>R. OF. EXETER — I. S.</i>	‡
*140.	<i>O. RICHARD. TAMLING — A Dragon.</i>	
	<i>R. IN. EXON. 1666 — R. T.</i>	‡
141.	<i>O. JOHN. TREWMAN — Three wool bags.</i>	
	<i>R. OF. EXON. 1668 — I. T.</i>	‡
142.	<i>O. AT THE MAIREMAID — W</i>	
	<i>R. IN. EXON. 1666 — A mermaid.</i>	‡
143.	<i>O. THOMAS. WHITE — 1659</i>	
	<i>R. IN. EXON. 1659 — T. W.</i>	‡
144.	<i>O. RICHARD. WINBALL — A stick of candles.</i>	
	<i>R. IN. EXTER. 1659 — The Tallow Chandlers' Arms.</i>	‡
145.	<i>O. WILLIAM. WOLLMAN — w. w. A roll of tobacco.</i>	
	<i>R. OF. EXON. 1669 — A stick of candles.</i>	‡
*146.	<i>R. A variety of No. 145, reads 1668</i>	‡

† This culinary vessel, locally called a crock (of the same shape as it was 200 years ago), is still generally used on open hearth fires.

EXMOUTH.

147. *O.* THOMAS. LAIGH
R. OF. EXMOVTH

HARTLAND.

- *148. *O.* JOHN. RANDELL — A shuttle.
R. OF. HARTLAND. (16)64 — I. R.

HEMYOCK.

149. *O.* ROBERT. SELLECKE — A horn.
R. OF. HEMYOCKE — R. S

HOLSWORTHY.

150. *O.* HENRY. CAD. 1667 — An anchor.
R. OF. HOLSWORTHY — H. A. C
151. *O.* GEORGE. HINGSTON — 1669
R. OF. HOLSWORTHY — G. A. H

HONITON.

152. *O.* THOMAS. ASH. 1664 — The Salters' Arms.
R. IN. HONYTON — T. B. A

153. *O.* DANIEL. CLEELAND — A lion rampant.
R. OF. HONITON — D. M. C

154. *O.* JOHN. HALL — 1663
R. IN. HONYTON — I. R. H

- *155. *O.* THOMAS. HVMPHREYS — A lion rampant.
R. OF. HVNYTON. 1668 — T. A. H

156. *O.* JOHN. MINIFIE — I. I. M
R. OF. HONITON — I. I. M

157. *O.* RICHARD. NORTHCOT — R. N
R. OF. HONYTON. MERCER — 1660.

There is another Northcot at Plymouth. (See No. 208.)

158. *O.* SAMVEL. POWNING — A lion passant gardant.
R. IN. HONITON. 1663 — S. A. P

159. *O.* JOHN. RICHARDS. OF — I. M. R
R. HONITON. MARCHANT — 1657

160. *R.* A variety of 159 has the date 1663

161. *O.* ROGER. SACHELL. IN — R. E. S
R. HONITON. 1657 — R. E. S

- *162. *O.* ORLANDO. SEARLE — A pair of shears. (See Plate, No. 9.)
R. OF. HONITON. 1667 — HIS HALF. PENY

163. *O.* HENRY. TANNER — A hat and feather.
R. IN. HONITON. 1664 — H. E. T

IVYBRIDGE.

- *164. *O.* AT THE GOATE. 1657 — A Goat.
R. AT. IVEY. BRIDGE — A. B. M

It is possible this may be a London token, as I am informed by Mr. Golding there was an Ivybridge in the Metropolis.

KENTON.

165. O. JOHN . WHITROE — I. W
R. IN . KENTON — 1654

This token was recently found in Exeter. Mr. Boyne erroneously assigned it to Kineton, Co. Warwick.

KINGSBIDGE.

166. O. JAMES . BOWEN — The Mercers' Arms.
R. IN . KING . BRIDGE — I. T. B
*167. O. EDWARD . HAYMAN — St. George and Dragon.
R. IN . KING . BRIDGE . (16)59 — E. I. H

KINGSWEAR.

- *168. O. JAMES . BUTLER . OF — A still.
R. KING . WYRE . IN . DEVON — I. K. B

LYMPSTONE.

- *169. O. JOHN . REED . IN . THE — 1666
R. PARISH . OF . LIMSON — I. E. R
It is still pronounced Limson by the natives.

MODBURY.

170. O. IONATHEN . ELLE — A hat.
R. OF . MODBVRY . 1664 — A roll of tobacco.
171. O. THOMAS . POTTELL — Arms, a chevron between three heads couped.
R. OF . MODBVRY . 1668 — T. M. P

MORETON HAMPSTEAD.

172. O. Y^E. 8. MEN . AND . FEEFEEKS — OF . MORTON . 1670
R. FOR . Y^E. BENEFIT . OF . Y^E. POOR — A church.
*173. O. AN . HALFPENNY . FOR . Y^E. BENEFIT — A church. { Plate,
*R. OF . Y^E. POORE . OF . MORETON — HEMPSTED . 1670 } No.10. $\frac{1}{2}$
174. O. THOMAS . AISH — HIS HALF - PENY
R. IN . MORTON . 1666 — T. S. A
175. O. JOHN . NEWTON — A man making candles. I. M. N
R. IN . MORTON . 1667 — HIS HALF - PENY
As there are other Mortons in England, the two last may belong elsewhere; but both Ash and Newton are Devonshire names.
176. O. JOHN . TUCKER . 1668 — A pair of scissors.
*R. OF . MOORTON . HAMSTED — HIS HALFE . PENNY. I. I. T**

NEWTON ABBOT.

177. O. WM . FVRNEAVX . OF . NEWTON — The family Arms.
R. ABBOTT . IN . DEVONSHEIR — HIS HALF . PENY
178. O. ELIZABETH . MANINGE . 1668 — OF . NEWTON . ABBETT
R. IN . THE . COUNTY . OF . DEVON — HER . HALFE PENNY. E. M $\frac{1}{2}$
179. O. IOHN . MANINGE . OF — HIS HALF PENY
R. NEWTON . ABOT . 1669 — I. E. M

NEWTON BUSHEL.

180. *O.* RICHARD . REYNELL — The Mercers' Arms.
R OF. NEWTON . BUSHELL — R. R. 1

OKEHAMPTON.

181. *O.* CHRISTOPHER . DREWE — C. D
R OF. OKEHAMPTON — The Mercers' Arms. 1
 182. *O.* HESTER. GEYRE. OF — H. G
R. OKHAMPTON. 1652 — H. G 1
 183. *O.* WILLIAM . PINGSTON . OF — A woolpack.
R. OCKHAMPTON . HIS . HALF . PENY — W. P 1
 184. *O.* IOHN . SHEBBEAR — Arms of the family.
R. IN. OKEHAMPTON. 1667 — HIS HALF . PENY 1
 *185. *O.* IOHN . SHEBBER — The Grocers' Arms.
R. IN. OKHAMPTON — I. S 1

This is probably the same issuer as No. 184, although spelt differently.
 186. *O.* FRANCIS . SQUIRE . OF — A roll of tobacco and a pipe.
R. OKEHAMPTON . MERCER — HIS HALF . PENY. F. G. S 1

OTTERY ST. MARY.

187. *O.* RICHARD . CORNISH — A woolpack.
R. OF. OTTRY . ST. MARIES — R. R. C 1
 188. *O.* HANNYBALL . FOLLET — A lion rampant.
R. IN. OTTERY . ST. MARY — H. B. F. 1666 1
 189. *O.* RICHARD . HVLL. 1666 — A woolpack.
R. IN. OTTERY . ST . MAREY — R. E. H 1
 190. *O.* THOMAS . OSMOND — A double-headed eagle.
R. IN. OTTERY . ST. MARY — T. D. O 1
 191. *O.* RICHARD . TEAPE . OF — 1666
R. ST . MARY . AVTERY — R. M. T 1

PLYMOUTH.

192. *O.* ABRAHAM . APPELBE — A ship in full sail.
R. OF. PLYMOTH . 1666 — A. M. A 1
 *193. *O.* ELIZABETH . BRAND — The Coopers' Arms.
R. OF. PLYMOUTH . 1667 — E. B 1
 *194. *O.* HENRY . CLARKE — A lion rampant.
R. OF. PLIMOVTH . 1667 — H. M. C 1
 195. *O.* NICHOLAS . COLE — A full blown rose.
R. OF. PLYMOTH . 1665 — N. C 1

Nicholas Cole was one of the Society of Friends, and suffered much on that account. In 1660 he was taken out of a meeting at Plymouth with others by eight constables and before the Mayor, when, because he refused to take the oath of allegiance, he was sent to prison at Exeter. Again, in 1662, he was sent to the County Goal "for being at a conventicle, and holding it unlawful to swear in any case." He with others lay there till the next sessions. In 1663 he was fined 12d. for absence from public worship; and because he refused to pay, goods worth 6s. were taken away. In 1664 N. C. opened his shop after the soldiers had been sent to close it, for which he was taken before the Mayor, when,

rather than give sureties for his good behaviour, he was committed to prison, and remained there for thirteen days. (From information supplied to me by Chas. Golding, Esq.)

196.	<i>O. JOHN COOKE — Arms, a chevron between three pears. R. IN. PLYMOVT — I. M. O</i>	½
*197.	<i>O. HENRY. DAVIS — HIS HALF. PENNY R. PLYMOVT. 1669 — H. D</i>	½
198.	<i>O. BENIAMAN. DVNNING — A castle. R. IN. PLYMOVT. 1666 — B. D</i>	½
199.	<i>O. MARGRET. EATON — The Apothecaries' Arms. R. IN. PLIMOVTH. 1655 — M. E</i>	½
200.	<i>O. GRACE. ELLIOTT — The Mercers' Arms. R. OF. PLYMOVT — G. E</i>	½
201.	<i>O. IVDITH. FORD — 1669 R. OF. PLYMOVT — I. F</i>	½
202.	<i>O. IOACHIM. GEVERS — A castle. R. OF. PLYMOVT. 1656 — I. A. G</i>	½
203.	<i>O. CHRISTOPHER. HATCH — A swan. R. OF. PLYMOVT. 1658 — C. R. H</i>	½
204.	<i>O. MICHAEL. HOOKE. GROCER — The Grocers' Arms. R. IN. PLIMOVTH. 1667 — HIS HALF PENY</i>	½
*205.	<i>O. JAMES. IRISH. AT. Y — Three fish hooks. R. OF. PLYMOVT. 1667 — I. E. I</i>	½
206.	<i>O. JAMES. JACKSON. AT. THE — The sun. R. SVNN. IN. PLYMOVT. 1651 — I. G. I</i>	½
207.	<i>O. WM. MOVNTSTEPHEN — 1670 R. OF. PLYMOVT — W. P. M</i>	½
208.	<i>O. SAMVELL. NORTHCOTT — S. N R. POSTMA. IN. PLYMOVT — 1653</i>	½
<p>S. N. was Mayor of the Borough in 1658, and we learn from Worth's "History of Plymouth," that he established a poet house for letters; the word "Postma" on the token is evidently an abridgment of Postmaster. Mr. Worth further informs us, he was a sufferer for conscience sake. During his mayoralty he was required to give currency in church to a proclamation issued by Parliament. He refused from scruples of piety, and was immediately sent for to London, and imprisoned. This untoward affair ended in his ruin. "History of Plymouth," page 133. It is probable the celebrated historical painter, James Northcote, R.A., was one of this family. He was born at Plymouth in 1746, and his father was a watchmaker.</p>		
209.	<i>O. ROGER. OLIVER. 1663 — Arms, a chevron between three trees. R. IN. PLYMOVT. MERCER — R. O</i>	½
210.	<i>O. EDWARD. PATESON — The Drapers' Arms. R. IN. PLYMOVT — E. A. P</i>	½
211.	<i>O. JOHN. PAYNE — A Pelican feeding its young. R. IN. PLYMOVT. 1656 — I. P</i>	½
212.	<i>O. SIMON. PAYNTER — Four castles (Arms of Plymouth.) R. PLYMOVT. 1657 — S. A. P</i>	½

213. *O. RICHARD . PERRY . 1658* — A man making candles.
R. IN . PLYMOVTN — R. D. P
214. *O. HENRY . PIKE . AT . THE . THREE* — Three Cranes.
R. CRANES . IN . PLYMOVTN — H. P conjoined.
215. *O. THO . PIKE . AT . Y^r. 4* — The Arms of Plymouth.
R. CASTLES . IN . PLYMOTH — T. P. 1657
216. *O. WILLIAM . REEPE — 1666*
R. OF . PLYMOVTN — W. I. R
217. *O. WILLIAM . TOM . GROCER* — *Arms of the Tom family.
R. IN . PLIMOVTH . 1667 — HIS HALF PENY. W. T
- *218. *O. ADAM . TVRTLY — The Grocers' Arms.*
R. IN . PLYMOTH — A. T
219. *O. WILLIAM . WARREN — A fleece.*
R. IN . PLYMOVTN . 1656 — w. i. w
- *220. *R. A variety has no date. Initials w. w*
221. *O. WILLIAM . WEEKS — A clasped book.*
R. IN . PLYMOVTN . 1659 — w. s. w
- *222. *O. IOHN . WILLIAMS — An open book.*
R. IN . PLYMOVTN . STATIONER — I. W

ST. THOMAS.

223. *O. DAVID . HARTE . OF — A warehouse.*
R. ST. THOMAS . 1666 — A wool-comb.
224. *O. DAVID . HART . ST — EXON*
R. THOMAS . NEERE — EXON
225. *O. WILLIAM . SNOW . OF . ST — EXON*
R. THOMAS . NEAR . EXETER — A pair of scales.
- *226. *R. A variety has date 1671 in the field of R.*

SALCOMBE.

- *227. *O. THOMAS . COLLMAN — The Glaziers' Arms.*
R. OF . SALCOMBE — T. C. and two small roses.
228. *O. FRANCIS . FORD . OF — A dolphin.*
R. SALCOMBE . 1659 — F. E. F

SAMPFORD PEVEREL.

229. *O. IOHN . STONE . IN . 1670 — HIS HALFE . PENNY*
R. SAMPFORD . PEVERELL — I. M. S

SANDFORD.

230. *O. WILLIAM . MANLY — W. I. M*
R. OF . SANFORD — W. I. M
231. *O. GILBERT . NICOALLS — A shuttle.*
R. IN . SANDFORD . 1660 — G. M. N

* Three bucks' heads couped; crest, a Cornish chough. W. T. was Mayor of the Town in 1677-78.

SHEEPWASH.

- *232. *O.* BARTHOLOMEW. VENTON — B. I. V
R. IN. SHEEPWASH. 1668 — HIS HALFE PENNY

 $\frac{1}{2}$

SILVERTON.

233. *O.* HENRY. WALTER. IN. 1666 — A horse passant.
R. SILVERTON. HIS. HALF. PENY — H. W

 $\frac{1}{2}$

234. *O.* SILEFTON — 1660
R. DEVONSHEIRE — I. Y

 $\frac{1}{2}$

SOUTHMOLTON.

235. *O.* IOHN. ANTHONY — 1667
R. OF. SOVTH. MOVLTON — I. A. and merchant's mark.

 $\frac{1}{2}$

- *236. *O.* SAMVELL. BADCOCK — A cock.
R. IN. SOVTH. MOVLTON — S. B

 $\frac{1}{2}$

- *237. *O.* RICHARD. BOWDEN — A stocking and two annulets.
R. OF. SOVTH. MOVLTON. (16)69 — R. E. B

 $\frac{1}{2}$

238. *O.* RICHARD. BOWDEN. 1669 — A stocking, &c., as No. 237.
R. OF. SOVTH. MOVLTON — R. E. B. and ornamental knot.

 $\frac{1}{2}$

- *239. *O.* ED. BROAD. SOVTHMOLTON — The Mercers' Arms in shield.
R. WHEN. YOU. PLEASE. ILE. CHAINGE. THESE — $\frac{1}{2}$

 $\frac{1}{2}$

A very rare and curious unpublished token, with the legend on reverse in a double circle. (See Plate, No. 11.)

- *240. *O.* WILLIAM. DOWNES. OF — A bell.
R. SOVTH. MOVLTON. 1652 — W. E. D

 $\frac{1}{2}$

241. *O.* HENRY. IESS. 1668 — Two shuttles.
R. OF. SOVTH. MOVLTON — HIS HALF. PENY

 $\frac{1}{2}$

- *242. *O.* THOMAS. LAKE. 1668 — A horse saddled and bridled.
R. OF. SOVTH. MOVLTON — T. M. L

 $\frac{1}{2}$

243. *O.* CHRISTOPHER. MAY. IN — A fleur-de-lys.
R. SOVTH. MOVLTON. 1668 — HIS HALFE PENY. C. E. M

 $\frac{1}{2}$

TAWTON (NORTH).

244. *O.* JAMES. DAGGARY — A dagger. $\frac{1}{2}$ D.
R. IN. NORTH. TAWTON — I. E. D

 $\frac{1}{2}$

TAWTON (SOUTH).

245. *O.* IOHN. LETHBRIDGE. OF. SOVTH — I. M. L (See plate, No. 11.)
R. TAWTON. CHAGFORD. AND. MORETON — HIS HALFE PENNY

 $\frac{1}{2}$

Probably the same man who issued the Zeal $\frac{1}{2}$ d.; if so, he had shops in four villages.

TEIGNMOUTH.

246. *O.* THOMAS. IORDAN — T. I
R. OF. TING. MOVTH. 1654 — T. I

 $\frac{1}{2}$

THORNCOMBE.

- *247. *O.* ROGER. BRIANT. OF — Pair of shears.
R. THORNECVM. 1657 — R. B

 $\frac{1}{2}$

248. *O.* SAMVELL . STAPLE — A pair of scales.
R. OF. THORNCOMBE . (16)68 — S. E. S

The parish of Thorcombe, formerly a detached part of Devon, was allotted to Dorsetshire by Act of Parliament in 1842; but as this list represents a state of things 200 years ago, I have thought it right to retain these tokens in our County Series.—H. S. G.

THORVERTON.

249. *O.* IOHN . THOMAS — A dolphin.
R. IN . THARVERTON — I. W. T

TIVERTON.

250. *O.* THOMAS . ALLDREAD — The Clothworkers' Arms.

R. OF. TIVERTON . 1667 — HIS HALF PENY. (Plate No. 13.)
A descendant of this family is still living (name now spelt "Aldred"), who can recollect his father being in the cloth trade, and whose trade was ruined by the First Napoleon blockading the ports of Holland.

251. *O.* FRANCOIS . BELLAMY — A fleece.

R. OF. TIVERTON . (16)64 — F. B

252. *O.* RICHARD . BELLAMY — A fleece.

R. OF. TIVERTON . 1661 — R. H. B

253. *O.* JAMES . CLARKE — HIS . HALF PENY

R. IN . TIVERTON . 1666 — I. E. O

I. C. was Churchwarden of Tiverton in 1653. The office of Churchwarden is an important one at Tiverton, and it is generally occupied by men of good local standing. In addition to the ordinary duties connected with it, the Churchwarden of that Borough is legal custodian and manager of several important Charities.

254. *O.* THOMAS . DAYMAN — A fess indented. (?)

R. OF. TIVERTON (16)58 — T. A. D

This person's name is spelt Deyman in the old Parish Register.

255. *O.* WILLIAM . DAYMAN — Arms as last.

R. IN . TIVERTON . 1666 — HIS HALF PENY

W. D. was Churchwarden in 1666, and was a Clothier.

- *256 *O.* WILLIAM . DAYMAN — Three diamonds.

R. BARRINTON . TIVERTON — W. A. D

Barrington is one of the old streets of the town.

- *257. *O.* WILLIAM . DIAMAN — Three diamonds.

R. IN . TIVERTON . 1664 — W. A. D

From the device on the *O.* and the initials on the *R.* being like the preceding one, it is likely this token was issued by the same person.

258. *O.* THOMAS . FOWLER — The Mercers' Arms.

R. IN . TIVERTON . 1652 — T. F

He was acting Churchwarden in 1647, and Mayor of the Borough in 1666.

- *259. *O.* ROGER . FROST . IN . TIVERTON — R. R. F

R. HIS . HALFE . PENNY (in three lines). — A shuttle

We learn by the old register his wife's name was Ruth.

260. *O.* IOHN . GODDARD . OF — 1657

R. TIVERTON . DEVONSH^E — I. G conjoined

J. G. was acting Churchwarden in 1641. He was also one of the Trustees of Chilcot's Charity, and his autograph appears in their old account book.

261. *O. FRANCIS. HOW. 1659 — A cloth brush. (?)*

R. IN. TYVERTON — F. A. H.

‡

262. *O. GREGORY. MAVRY — Three moor cocks.*

R. IN. TIVERTON. 1667 — G. S. M.

‡

It is probable the moor fowl was a punning device referring to the name of the issuer. We learn from the old Church Register that he was a Clothier, and that his wife's Christian name was Sidwell.

263. *O. MICHAELL. OTWAY — M. W. O*

R. IN. TIVERTON. 1666 — HIS HALF. PENNY

‡

We learn from the Parish Register that he was a Clothier. His name is spelt there "Oatway."

264. *O. IOHN. PATEE — 1661*

R. IN. TIVERTON — I. P.

‡

- *265. *O. IOHN. PATY. OF — A cock.*

R. TIVERTON. 1664 — HIS HALF. PENY

‡

There is little doubt this was the same man who issued the farthing. The name is still to be met with in the town, but is now spelt Patey.

266. *O. THOMAS. SAMFORD — A fleur-de-lys.*

R. IN. TIVERTON — T. A. S.

‡

He was acting Churchwarden in 1669. His name is spelt Sampford by the local historian, Martin Dunsford.

267. *O. AQUILA. SKINNER — Three fleurs-de-lys.*

R. OF. TIVERTON. 1651 — A. C. S.

‡

- *268. *O. A variety reads, TYVERTON*

A. S. was a Mercer, and was Churchwarden in 1637. There is a singular letter, still preserved, from the Lord Lieutenant of Devon, to Thomas Fowler, Esq., Mayor of Tiverton, dated March 15th, 1655, giving orders that Aquila Skinner and four others (named) should be turned out of the Corporation, as "Enemies to the Commonwealth," and that five others (named) should take their places.

269. *O. RICH. STRANGAR. TALLOW — A man making candles.*

R. CHANLER. IN. TIVERTON — R. P. S. (Plate No. 14.)

‡

270. *O. IOHN. VPCOTT — 1657*

R. OF. TIVERTON — I. V.

‡

He was Churchwarden in 1645. The family afterwards removed to Collumpton, and took their trade of Clothiers with them.

271. *O. WILLIAM. WARREN. OF — W. T. W.*

R. TIVERTON. MERCER. 1666 — HIS. HALF. PENY

‡

The old register informs us that his wife's name was Thomasin.

- *272. *O. THOMAS. WEBBER. IN — A diamond.*

R. TIVERTON. 1666 — T. K. W.

‡

We learn from the Church Register that he was a Clothier.

273. *O. RICHARD. WOOD — 1663*

R. IN. TIVERTON — R. E. W.

‡

He was Churchwarden in 1670.

TOPSHAM.

274. *O. SVSAN. DRAKE. OF — A wyvern.*

R. TOPSHAM. IN. COVN(TY). DEVON — S. D.

‡

Probably S. D. was a collateral branch of the celebrated Drake family of this county, whose arms were argent, a wyvern, with wings displayed, gules.

275. *O.* ROBERT . NEWCOMBE — A fleur-de-lys.
R. OF . TOPSHAM . 1668 — R . S . N
*276. *O.* PETER . TRAPNELL . OF — 1668
R. TOPSHAM . MERCER — P . D . T

TORRINGTON.

277. *O.* GREAT . TORRINGTON . 1668. (In four lines).
R. A fleur-de-lys issuing from water. (The Arms of the
Borough.)
278. *O.* ANTHONY . DENIS . IN — A stick of candles.
R. GREAT . TORINGETON — HIS HALFE PENY TOKEN
279. *O.* IAMES . GLOYN . 1669 — A pack horse.
R. IN . GREAT . TORRINGTON — HIS . HALF . PENY
280. *O.* RALPH . HARBOTTLE — A bottle on a hare.
R. GREAT . TORRINGTON — G . E . H
- *281. *O.* GEORGE . TITHERLY — 1666
R. IN . GREAT . TORINGTON — G . D . T
282. *O.* RICHARD . TUCKER . OF (Script, in three lines).
R. GREAT . TERRINGTON . 1668 (Script, in three lines).

TOTNES.

- *283. *O.* IAMES . COCKEY — A cock.
R. OF . TOTNES . 1668 — I . E . C
284. *O.* EDMOND . CORBYN — A cavalier's hat.
R. OF . TOTTNES . 1668 — HIS HALF PENY . E . S . C
285. *O.* IOHN . CROSSE — A cross.
R. IN . TOTNES . 1669 — HIS . HALF . PENY
- *286. *O.* PETER . GAILARD — The Barber-Surgeons' Arms.
R. IN . TOTNES . 1657 — P . E . G
287. *O.* IEAMS . MARTYN . OF — I . M
R. TOTNESS . IN . DEVON I . M
- *288. *O.* A variety is dated 1653.
289. *O.* WILLIAM . RVMBELLO — The Weavers' Arms.
R. IN . TOTTNES — W . I . R
290. *O.* IOHN . RENNELL . OF — A hoop.
R. TOTNES . IN . DEVON — VINTNER
- *291. *O.* PETOLOMVS . SAMPSON — The Mercers' Arms.
R. OF . TOTTONES — P . S
292. *O.* PETER . WILLIAMS — The Haberdashers' Arms.
R. OF . TOTNES — P . T . W

UFFCULME.

293. *O.* ROBERT . BATT . OF — The Clothworkers' Arms.
R. VFCVLME . DEVON . 1671 — HIS HALFE PENNY
294. *O.* HVMPHREY . BOWDEN . OF — The Clothworkers' Arms.
R. VFCVLME . DEVON . 1668 — HIS HALF PENY
295. *O.* HVMPHREY . BOWDEN — The same.
R. OF . VFCVLM . DEVON — H . E . B

- *296. *O. JOHN. DYER. OF — 1658*
R. VF COMB. IN. DEVON — I. M. D

- *297. *O. FRANCIS. PRATT — 1666*
R. IN. VPCVLME — F. E. P

This unpublished token was kindly presented to me by H. Christie, Esq., London.

UPLYME.

298. *O. JOHN. LIDDON. 1667 — A mop.*
R. IN. VPPLYME. IN. DEVON — I. M. L

299. *O. A variety reads "Lidon," and is not nearly so rare as No. 298.*

ZEAL.

300. *O. JOHN. LETHBRIDGE — Three wheat sheaves in a row* $\frac{1}{2}$
R. OF. SOVTH. ZEALE — HALF PENY

I am indebted to the kindness of the following gentlemen for the loan of the tokens that are engraved:—To Chas. Golding, Esq., for Nos. 1, 3, 5, 6, 8, 10; to J. S. Smallfield, Esq., for Nos. 3, 4, 12; to Henry Christie, Esq., for No. 7; the other four are from my own collection.

ON RAINFALL AS AFFECTED BY THE HEIGHT OF GAUGES ABOVE THE GROUND.

BY E. VIVIAN, F.M.S.

(Read at Exeter, July, 1872.)

IN my decennial summary of the meteorology of Torquay, which was published in the first volume of the Transactions of this Association (A.D. 1864), the rainfall was calculated from the amount collected in a gauge placed on the roof of my house at Woodfield, about 40 feet above the ground (the comparative returns from Bristol, &c., were then taken at a similar elevation), and 200 feet above the sea level. In Mr. Pengelly's paper, which will be read to-day, my returns are given from a gauge only four inches above the ground. The cause of the difference in amount caused by altitude is a problem yet to be solved. It amounts, in the present instance, to a deficiency of about one-fifth at the higher level. This result has been assigned to various causes. Some meteorologists suppose that the atmospheric vapour is condensed, or the small floating drops annexed, by the colder rain; but this seems insufficient to produce the result, the total amount of

vapour, according to Glashier's Tables, in a cubic foot of air, even if saturated at 80° , being only 10.81 grains, and the condensation only yielding 4.15 grains of water if the temperature is reduced ten degrees; in most cases the humidity of the air is increased instead of diminished by a fall of rain. Another theory is, that in higher and more exposed positions the drops fall less perpendicularly, and some are carried over the gauge. This is in some measure confirmed by a proportionately larger amount being received in a vertical gauge turned towards the wind when that in the horizontal gauge is diminished.

As electricity is the resource of puzzled philosophers, it is very remarkable that during the recent thunderstorms the amount collected on my roof was rather greater than on the lawn (viz., .47 and .44 inch respectively on the 24th instant, and .19 and .17 on the 28th of this month). Possibly I had a mild water-spout playing over my head, the electrical conditions of the earth and clouds being opposite during a storm, and consequently exercising a mutual attraction. Under ordinary circumstances, it is just possible that both being either positive or negative, an elevated object may repel the falling drops, or at least not collect the floating vapour. The phenomena of dew seem to confirm this. The wind on those days was very moderate, and the rain drops large.

TOTAL AMOUNT OF RAIN IN GAUGES.

1871.	Force of wind.	Inches on roof.	Inches on lawn.	Actual Difference.	Difference per cent.
January	3.0	2.58	3.55	.99	.28
February	2.7	1.81	2.53	.72	.29
March	2.9	1.11	1.80	.69	.39
April	2.9	3.75	4.60	.85	.19
May	2.5	.28	.35	.07	.20
June	2.5	1.62	2.05	.43	.21
July	?	2.12	2.24	.12	.06
August	?	1.98	2.49	.51	.21
September	2.3	6.68	7.37	.69	.10
October	2.3	3.63	4.43	.80	.19
November	2.2	1.06	1.19	.13	.11
December	2.2	2.52	3.43	.91	.27
	2.5	29.14	36.03	6.89	.20

ACCOUNT OF RAIN IN GAUGES ON DAYS IN WHICH 30 INCHES
AND UPWARDS WAS COLLECTED.

1871.	WIND.		On roof. Inches.	On lawn. Inches.	Difference.
	Point.	Force.			
January 10	S.	3	.39	.43	.04
" 15	S.W.	4	.46	.70	.24
" 16	S.W.	4	.23	.37	.14
" 21	S.E.	2	.47	.50	.03
February 4	S.	2	.31	.34	.03
" 9	N.	3	.33	.44	.11
" 26	S.	4.3	.23	.36	.13
March 9	S.W.	5.3	.35	.57	.22
" 15	N.	4.6	.23	.32	.09
April 11	E.S.	3	.65	.80	.25
" 18	S.	4	.54	.66	.12
" 28	S.W.	4	.34	.44	.10
June 19	W.	4	.51	.67	.16
September 6	N.W.	2	1.00	1.11	.11
" 23	N.W.	3	.84	.85	.01
" 25	N.E.	4	1.52	1.54	.02
" 26	E.	3	.61	.64	.03
" 27	N.E.S.	4	.78	1.04	.26
" 29	E.	2	.78	.80	.02
" 30	N.W.	2	.30	.41	.11
October 18	S.	2	.40	.51	.11
" 29	S.W.	3	.53	.60	.07
" 30	S.	2	.71	.73	.02
" 31	E.	3	.58	.63	.05
Novem. 24	N.E.	2	.42	.46	.04
Decem. 19	S.W.	2	.22	.42	.20
" 25	S.	4	.24	.33	.09
" 27	S.	2	.39	.51	.12
" 28	S.	4	.60	.78	.18
			3.0	14.96	17.96
					3.00

It will be seen from the preceding Tables that about half the amount of rain during the year fell in quantities exceeding three-tenths of an inch (14.96 inches on the roof, and 17.96 on the lawn, the remainder being 14.18 and 18.07). That the difference at the two levels was increased by force of the wind; but as this is noted only at 9 a.m., the influence does not appear to be so great as I have usually observed it to be when observed at the time the rain was falling.

VITAL STATISTICS

FROM THE EXPERIENCE OF THE UNITED KINGDOM TEMPERANCE
AND GENERAL PROVIDENT INSTITUTION.

BY E. VIVIAN, M.A.

(Read at Exeter, July, 1872.)

IN the year 1840 the United Kingdom Temperance and General Provident Institution was established by some earnest teetotalers, in order to avoid the burden of the extra mortality occasioned by even moderate drinking; and also to test the comparative longevity of Total Abstainers. As one of the Directors, I can state that the management and tables in both sections have been precisely the same, the funds only being kept distinct.

The results have been as follows:—

TOTAL ABSTINENCE SECTION.

Year.	Expected Claims.	Actual Claims.
1866	100 for £18,014	85 for £15,420
1867	105 „ 18,936	71 „ 8,830
1868	109 „ 20,024	95 „ 16,526
1869	115 „ 21,136	73 „ 16,505
1870	120 „ 22,336	87 „ 15,395
Total...549	£100,446	411 £72,676

GENERAL SECTION.

Year.	Expected Claims.	Actual Claims.
1866	180 for £34,732	186 for £39,129
1867	191 „ 37,003	169 „ 32,200
1868	202 „ 39,515	179 „ 57,055
1869	212 „ 41,583	201 „ 50,320
1870	223 „ 43,519	209 „ 57,593
Total...1,008	£196,352	944 £230,297

From these figures it appears that the mortality among the "Total Abstainers" insured in this office was, during the five years, 26 per cent. below the average upon which the tables are calculated; whilst in the "General" section, which is open to the public, the proportion was only 7 per cent. below the expected claims.

The pecuniary results, as shewn by the Reversionary Bonus declared on the premiums during previous quinquennial periods, have been as follows:—

Year.	Section.	Per cent.	Mean per cent.	Difference.
1860	Total Abstinence	35 to 86	61	20
	General	25 to 57	41	
1865	Total Abstinence	23 to 56	39	10
	General	17 to 42	29	
1870	Total Abstinence	34 to 84	59	25
	General	20 to 49	34	

From this it appears that the advantage in favour of the Total Abstinence Section was in the five years ending 1860 as 61 to 41; in the period ending 1865 as 39 to 29; and in 1870 as 59 to 34.

It might have been objected that these pecuniary results were occasioned by accidental differences in the amounts of policies which became payable in the several sections; but no such question can be raised in regard to the last quinquennial period, as given above; and the vast disparity between the lives of "total abstainers" and the general public can be attributed to no other cause than their entire abstinence from all alcoholic liquors.

The calamitous effects of actual drunkenness and spirit-drinking have been fully shewn in Mr. Neison's tables. My object now is to call attention to the comparative results of total abstinence from all distilled or fermented liquors, and of that very moderate drinking which exists amongst the insurers in our General Section, many of whom are practically almost abstainers.

Moderate drinking is also chargeable with at least half of the £100,000,000 annually expended in alcohol in this country, the destruction of corn enough to feed all Ireland, and the necessity for importation; it is also the source from which a stock of drunkards is derived to fill the vacancies caused by their premature deaths.

During the last thirty-two years, in which I have totally abstained, I have not only added nearly a third to my Life

Policy, and have saved wine merchants' and doctors' bills, but have spared the hospitality of my friends (at 5/- a week for champagne) more than £2,000! The cider ordinarily given in this county to agricultural labourers as part of their wages (3 pints a day, worth two pounds a year) would accumulate at 5 per cent. to £40 in fourteen years, or £120 in twenty-eight years, enough to obtain a freehold, through a Building Society, or to provide an amount of capital in a co-operative store or manufactory sufficient to extinguish pauperism, and solve many of the most difficult problems in social and political economy.

THE LITERATURE OF THE ORESTON CAVERNS, NEAR PLYMOUTH.

COMPILED BY W. PENGELLY, F.R.S., F.G.S.

(Read at Exeter, July, 1872.)

[*THE little village of Oreston stands on the left bank of the river Plym, very near the point at which it enters Plymouth Sound. It is essentially a limestone village, being based on, built of, and surrounded by that rock ; and its inhabitants extract their sustenance from the same material. Immediately behind it are the quarries whence the stone for the celebrated Plymouth breakwater was hewn, and which, through the disclosure of a series of ossiferous caverns, have rendered the spot famous amongst geologists and palæontologists.]

SIR EVERARD HOME, 1817.

[The earliest notice of the Oreston Caverns which I have been able to find is the following paper,† read to the Royal Society, by the late Sir Everard Home, February 27, 1817.]

“When Mr. WHITBY engaged to superintend this most arduous undertaking, Sir Joseph Banks requested him to examine narrowly any caverns he might meet with in the rock, and have the bones, or any other fossil remains that were met with, carefully preserved.

“Mr. WHITBY in compliance with this request, in November 1816, sent up to Sir Joseph Banks a box of fossil bones . . . found in a cavern, in the solid lime-stone rock, 15 feet wide, 45 feet long, taking the direction into the cliff, and 12 feet deep.

“This cavern was filled with solid clay, in which the bones

* [Everything within brackets in this paper is editorial. All else is by the various authors quoted.]

† “An Account of some Fossil Remains of the Rhinoceros, discovered by Mr. Whitby,‡ in a cavern enclosed in the limestone rock, from which he is forming the Break-water at Plymouth.” By Sir Everard Home, Bart., F.R.S., Phil. Trans. for the year MDCCCXVII. Part i. pp. 176–182.

‡ [The name was not “Whitby,” but “Whidbey.”]

were imbedded, and lay about 3 feet above the bottom of the cavern.

" When Mr. WHITBY began to work this quarry, the rock was 74 feet perpendicular above high water ; the bones were found 70 feet below the surface of the rock, and about 4 feet above high water mark. He quarried 60 feet horizontally into the cliff, before he came to the cavern. Before Mr. WHITBY began to quarry here, 100 feet had been quarried into the cliff, so that 160 feet was the distance between the cavern and the original edge of the cliff ; in all other directions the quarries consist of compact lime-stone to a great extent. The workmen came to this cavern by blasting through the solid rock, and at the depth in the rock at which it was met with, the surrounding lime-stone being every where equally strong, and requiring the same labour to quarry it ; Mr. WHITBY saw no possibility of the cavern having had any external communication, through the rock in which it was enclosed.

" The cavern was quarried within a foot of its bottom, the lower clay was not all cleared out, but the bottom was sounded by an iron crow, and rock was every where met with.

" Many such caverns, Mr. WHITBY says, have been met with in these quarries, and, in some instances, the rock on the inside was crusted with stalactite ; but nothing of that kind was met with in the cavern in which the bones were found ; so that there is no proof that any opening in the rock from above had been closed by infiltration.

. " As, in the contract of quarrying, there are two prices, one for rock, another for clay, earth and rubbish, and two officers attend, one for the crown, and the other on the part of the contractors, who measure the contents of all caverns that contain clay, or other soft materials, it is only necessary to mention that these officers state, that the rock surrounding the cavern, was equally hard with the other parts, requiring the same force to blast it, and that the quarrying was paid for accordingly."

[The author then gives a list of the bones, all of which "belonged to the Rhinoceros," and "were parts of the skeletons of three different animals." They were 6 molars, parts of 2 vertebrae, of 1 radius, of 1 scapula, of 2 ulnæ, of 3 humeri, of 3 femurs, of 2 phalanges, of 1 carpus, and 1 metacarpus.]

" All these bones are in the most perfect state of preservation ; almost every part of the surface entire, to a degree that I have never seen in specimens of fossil bones. The

metacarpal bone is complete except a small injury on one side of it, which it received probably at the time it was dug out of the clay.

"All the bones appear to have belonged to Rhinoceroses of nearly the same size, except the cotoyloid cavity of the left scapula, which evidently was part of the skeleton of a smaller animal, and the olecranon of the right fore leg of one still smaller.

"It is deserving of remark, that all the bones found in this cavern belonged to the same species of animal. Great pains were taken to ascertain whether there were any other bones than those sent up to London, but no others were discovered.

"Professor Brande analysed a portion of one of the bones and a portion of one of the teeth. He remarked, that he had never met with fossil bones so purely earthy, and free of extraneous matter.

"When the bone was heated, it exhaled scarcely any smell of animal matter, nor had it lost any of its natural whiteness. It consisted of 60 [per cent] Phosphate of lime, 28 Carbonate of lime, 2 Animal matter, 10 Water. The tooth consisted of 78 Phosphate of lime, 8 Carbonate of lime, 8 Extraneous earthy matter, 6 Animal matter, water and loss."

MR. WHIDBEY, 1820; AND SIR EVERARD HOME, 1821.

[In November, 1820, Mr. Whidbey sent to Sir Everard Home the following letter, which was read to the Royal Society on February 8th, 1821.*]

"Bovisand Lodge, near Plymouth,
11th Nov. 1820.

"Dear Sir,

In November 1816, I sent to Sir Joseph Banks, some fossil bones found in the lime stone quarries at Oreston, near Plymouth. I now take the liberty of sending you some more bones that have been subsequently found, nearly similarly situated, and not far from the place where the others were discovered.

"These bones were lately found in a cavern one foot high, eighteen feet wide, and twenty feet long, lying on a thin bed of dry clay at the bottom; the cavern was entirely sur-

* "A farther Account of Fossil Bones discovered in caverns inclosed in the lime stone rocks at Plymouth. By Joseph Whidbey, Esq. In a letter addressed to Sir Everard Home, Bart., V.P.R.S." Phil. Trans. for the year MDCCXXXI. Part i. pp. 133-5.

rounded by compact lime stone rock, about eight feet above high water mark, fifty-five feet below the surface of the rock, one hundred and seventy-four yards from the original face of the quarries, and about one hundred and twenty yards, in that direction, from the spot where the former bones were found in 1816.

"All this quarry had been worked by blasting through the solid rock, with here and there a few small caverns similar to that where the bones were discovered, but none of them had the smallest appearance of ever having had any opening to the surface, or connection with it whatever, or with each other. The caverns here spoken of were quarried many feet below the bottom of them, and nothing was found but hard solid lime-stone, in which the quarrying ceased, and the workmen proceeded on in an horizontal direction.

"Many caverns have been met with in these quarries, the insides of which have been crusted with stalactite; but there was no appearance of this kind in the cavern where the bones were found, every part of it being perfectly dry, and nearly clear of rubbish, a circumstance which clearly proves it had no connection with the surface, as in that case water would have found its way into it, the dropping of which would have formed stalactite, as in other instances.

"I also send you some other bones, found about the same time, four yards distant from those just mentioned, and I have reason to believe on the same level, and under exactly similar circumstances."

[To this account Sir Everard Home added a description of the bones, to the effect that they consisted of one molar "of the single horned rhinoceros," teeth and bones "of the black or brown bear," two portions of "bone of an animal of the deer kind," and portions of bone of some animal "of the size of a bear."]

The bones were deposited in the Museum of the Royal College of Surgeons.

It is, perhaps, noteworthy that, though the discovery of the famous Kirkdale Cavern undoubtedly gave a great stimulus to Cavern Researches in this country, it is obvious that such investigations by no means originated in it. The Kirkdale Cavern was not discovered until 1821, and we learn from the foregoing papers that when Mr. Whidbey engaged to superintend the Breakwater works, Sir Joseph Banks, President of the Royal Society, requested him to examine narrowly any caverns he might meet with in the rock, and have the bones or any other fossil remains that were met

with carefully preserved. Now the Breakwater quarries at Oreston were opened on 7th August, 1812, and Mr. Whidbey was appointed superintendent before the works began.* Moreover, Mr. Whidbey sent up bones from Oreston in November, 1816, and November, 1820, and in each instance a paper on them was read to the Royal Society in the following February.]

REV. MR. BUCKLAND, 1822.

[In a paper by the Rev. Mr. (afterwards Dr.) Buckland on the famous Kirkdale cavern, read to the Royal Society, February 21, 1822,† the author recapitulated the substance of the foregoing papers by Sir E. Home and Mr. Whidbey, and then made the following remarks on them :—]

"Mr. Whidbey is of opinion, that neither of these caverns had the appearance of ever having had any opening to the surface, or communication with it whatever; an opinion in which I can by no means acquiesce; though I think it probable that the openings had, as at Kirkdale, been long ago filled up with rubbish, mud, stalactite, or fragments of rock re-united, as sometimes happens, into a breccia as solid as the original rock, and overgrown with grass. It is now too late to appeal to the evidence of facts, as the rock in which the cave existed is entirely removed; but the circumstances of similar caverns that have communication with the surface, either open or concealed, both in this neighbourhood, and in compact lime-stone rock of all ages and formations, and in all countries, added to the identity of species and undecayed state of animal remains which they contain, render the argument from analogy perfect, to show that the bones of Oreston are not coeval, and have only an accidental connection with the rock in the cavities of which they were found.

"It by no means follows, from the certainty of the bones having been dragged in by beasts of prey to the small cavern at Kirkdale, that those of similar animals must have been introduced in all other cases in the same manner; for, as these animals were the antediluvian inhabitants of the countries

* [See "Guide to the Breakwater." By J. Claringbull. 1840.]

† "Account of an assemblage of Fossil Teeth and Bones of Elephant, Rhinoceros, Hippopotamus, Bear, Tiger, and Hyæna, and sixteen other animals; discovered in a cave at Kirkdale, Yorkshire, in the year 1821; with a comparative view of five similar caverns in various parts of England, and others on the Continent. By the Rev. William Buckland, F.R.S., F.L.S., Vice President of the Geological Society of London, and Professor of Mineralogy and Geology in the University of Oxford, &c., &c., &c." Phil. Trans. for the year MDCCCLXII. Part i. pp. 171-240.

in which the caves occur, it is possible, that some may have retired into them to die, others have fallen into the fissures by accident and there perished, and others have been washed in by the diluvial waters. By some one or more of these three latter hypotheses, we may explain those cases in which the bones are few in number and unbroken, the caverns large and the fissures extending upwards to the surface; but where they bear marks of having been lacerated by beasts of prey, and where the cavern is small, and the number of bones and teeth so great, and so disproportionate to each other as in the cave at Kirkdale, the only adequate explanation is, that they were collected by the agency of wild beasts."*

MR. WHIDBEY, 1822, AND MR. CLIFT, 1823.

[In 1822, Mr. Whidbey, having discovered other bone caverns at Oreston, sent the fossils to Mr. John Barrow, and with them the following letter, which was read to the Royal Society, February 6, 1823.†]

"Plymouth, 19th August, 1822.

Dear Sir,

In continuing to quarry the lime-stone rock at Oreston, in Catwater, near Plymouth, for the use of the Breakwater, the workmen came to another cave, containing many teeth and bones, which I have sent to you to be disposed of as you may please to direct for the benefit of science.

"I shall content myself with merely describing the situation in which they were discovered, together with the state and appearance of the rock.

"The height of the rock, or quarry, is about 93 feet above the top of high water of spring tides. The [second or inner] cave mostly consists of lime-stone, with bones adhering to its sides: the top is closed up with stone rubble. The teeth and bones found in the [first or outer] cave, were mostly covered with dirt; part of the bones were lying on the dirt, and in crevices about the caves.

"From the [first] cave a passage has been discovered into what I call a gallery, which gallery opens into the face of the quarry. The farther end of the gallery is

* Op. cit. pp. 214-5.

† "On some Fossil Bones discovered in Caverns in the Lime-stone Quarries of Oreston. By JOSEPH WHIDBEY, Esq., F.R.S. In a letter addressed to JOHN BARROW, Esq., F.R.S. To which is added, A Description of the Bones by MR. WILLIAM CLIFT, Conservator of the Museum of the College of Surgeons." Phil. Trans. for the year MDCCXXIII. Part i. pp. 78-90.

not closed, but it is not sufficiently wide for a man to creep into it. The sides of the gallery consist mostly of lime-stone, some clay, and stalactite. At [one part] the gallery was covered with masses or lumps of lime-stone, with much clay intermixed, and in general so compact that it required gunpowder to blast it asunder; and continued so to the surface of the country, a height of 15 feet.

"The general state of this quarry has been found to consist of more caves filled with clay, than any other; and nearly under the entrance of the cave where the bones were found, I have dug down through clay of so stiff and hard a nature as to render it difficult to dig into it, and it continued so until I got to six feet below high water, when rock again appeared, but not compact. In this digging many lumps of iron ore were found in the hard clay.

"The distance from the [first] cave, to the commencement of the quarry or harbour, is 201 yards, and to the cave where the first bones were found in November, 1816, 180 yards in a western direction.

..... "The face of the rock is very compact lime-stone, excepting [in one] part. In the lower part of it is a [third] cave.

"Professor BUCKLAND and Mr. WARBURTON have examined the Oreston quarries and caves that contained the bones, and they also found some themselves.

"I am, dear Sir, &c., &c.,

"JOSEPH WHIDBEY.

"N.B.—Since the bones were packed up, another jaw bone has been found, more perfect than any I have seen, with most of the teeth in it. This was found in [the second] cave, where many of the other bones were discovered."*

"*A Description of the Fossil Bones found in the Caverns of Oreston, referred to in the foregoing Paper. By Mr. WILLIAM CLIFT, Conservator of the Museum of the Royal College of Surgeons, in which the bones are deposited.*

"On receiving this large collection of fossil bones for the purpose of comparing them with those of recent animals, and with other specimens, now deposited in the Museum of the College, which were discovered in caverns in the same lime-stone rock in the years 1816 and 1820, I immediately perceived that they belonged chiefly, if not entirely, to animals

* Op. cit. pp. 78-81.

of different genera from those formerly met with ; and consequently, I became desirous of ascertaining how far they were similarly circumstanced in regard to the relative situations in which they were found ; because in the caverns first discovered, the bones of the different species were entirely separate from each other.

" In the cavern discovered in 1816, although the greatest care was taken to collect every bone contained in it, those of the rhinoceros alone were found.

" In those of 1820, one cavern contained bones and teeth of the bear; while another contiguous cavity, of apparently coeval formation, contained only bones of a deer or antelope; but of which, the genus could not be positively ascertained, as neither the teeth, nor horns, nor any part of the head were found.

" In the caverns discovered in 1822, the bones of animals of several distinct genera were found ; namely, the bos, the deer, the horse, the hyæna, the wolf, and the fox. These cavities, however, communicated with each other, and the bones of the different graminivorous animals were found mingled together in the same cavity ; but those of the carnivora at a considerable distance from each other ; the bones of the hyæna having been discovered in the [second] cavern, and those of the wolf and fox in the gallery. . . .

" Some of the bones and fragments of bones which lay on and near the surface of the clay, have acquired a thin crust of stalagmite, but in none of them does it appear to have penetrated beyond the surface : the greater number were imbedded in the stiff clay, which adhered so firmly to them, that many were broken by the workmen in separating them from the matrix ; and others have fallen to pieces since their exposure to the air ; but a great proportion of the cylindrical and other bones, of the graminivorous animals in particular, are still as perfect in form as at the time of the death of the animal to which they belonged, and do not exhibit the least appearance of having been gnawed or otherwise mutilated.

" The only specimen in this very large assemblage which bears any apparent marks of teeth, is a portion of the radius of a young wolf, which, in two or three places on its surface, has the impression of the incisors and canine teeth of some small animal of the size of a weasel.

" The clay still adhered so firmly to the surface of many of these bones, that unless removed with considerable caution, the outer layers separated along with it, and showed that but little animal matter remained ; and on submitting some of

these fragile portions to the action of dilute muriatic acid, they almost entirely dissolved, leaving scarcely any trace of animal matter. In this respect there is a considerable difference in various specimens. In some comparative trials made by Professor BUCKLAND, although the proportion of animal matter was greater than in my experiment, he found that these bones contained about one-third part less than the bones from the cavern at Kirkdale.

"Is it not therefore probable, that the clay immediately surrounding the bones, which is of a darker colour as well as more tenacious than that in which no bones were found, may have abstracted a large proportion of the animal matter, and be the principal cause of the extremely fragile state of the bones? for they are now so absorbent, that if the largest of them be applied to the surface of the tongue, they adhere so firmly as to support their whole weight. In this, they resemble those bones which were discovered in 1816, and 1820; most of them being as white and fragile as though they had been calcined.

"It would appear that the loss of animal matter, and consequently decay or decomposition of fossil bones, depends very much upon the nature of the soil in which they are deposited, and on its elevation, and different degrees of moisture at different periods; and perhaps, in a great measure on the density or compactness of the bones themselves.

"On immersing the bones of the carnivorous animals in water, more effectually to remove the clay without injuring the surface, they effervesced strongly, and became nearly of a black colour, but recovered their former appearance on drying. A similar effect was produced, but in a less degree as to colour, on the bones of the bovine animals, and of the horse.

"It may be worthy of remark, that appearances of disease in fossil bones are of rare occurrence; and I have never yet seen an instance of fracture that had been united during the life of the animal: but among these occur two examples in the metacarpal and metatarsal bones of bovine animals, which unequivocally show the effects of ossific inflammation on their surface; and the lower jaw of a young wolf, in which an abscess on each side had produced sinuses, and a considerable alteration in its form and texture.

"All the bones from these caverns which have come under my observation, are clearly referable to animals of known, and still existing genera, but it is a curious circumstance, that, with the exception of the very few

belonging to the deer, they all appertained to animals entirely differing from those found in the immediate vicinity in the former instances.

"Of the bovine genus, there are specimens of the bony core of the horns belonging to three individuals of different size; all of them remarkably short, conical, and slightly curved, and standing in a nearly horizontal direction from the head. They evidently do not belong to very young animals, and from the appearance of these alone, a very small species would be inferred; but numerous specimens of the teeth, of the os humeri, ulna and radius, os femoris, tibia, os calcis, metacarpus and metatarsus, and phalanges, clearly prove that they belonged to individuals considerably larger than the average size of animals of that genus at the present day.

"The number of bones collected, afford sufficient grounds for supposing them to have belonged to more than a dozen individuals, varying considerably in their age.

"Of smaller ruminants, there are a few portions of the cylindrical bones belonging to one or two individuals, which are too imperfect to admit of being satisfactorily identified, but apparently are those of a deer; and some others belonging to very young animals in which the epiphyses had not been united, and consequently the bones had not acquired sufficient distinctness of character to allow of our speaking decidedly concerning them; but they have been most probably those of a calf or fawn.

"Of the horse, the bones are satisfactorily identified by various specimens of the teeth, the large cylindrical bones, the os calcis, metacarpus and metatarsus, first and second coronary bones, the sesamoid or nut bone, and particularly by the terminal phalange or coffin bone of the foot. From the number of these there must have been twelve or more individuals of not less than fourteen hands high; one of the metatarsal bones measuring eleven inches and a half in length. Some of these animals, from the worn state of the teeth, appear to have been very aged.

"Of the hyæna, there are bones and teeth which belonged to at least five or six individuals of various ages; some of them equalling the largest of those found at Kirkdale in 1820. Among these, is a part of the right side of the lower jaw, in which remain one of the shedding molar teeth, and two permanent ones which have not sufficiently advanced to have protruded through the gum, but are still enclosed within the alveolar cavities. Also part of the right side of the lower jaw of an adult animal, with the teeth in a good state of

preservation. This specimen was discovered in the [second] cavern.

"There are likewise detached specimens of the canine teeth and molares of individuals of very large size: and the posterior part of a skull of uncommon magnitude, which corresponds most exactly in form with that of a hyæna, and must undoubtedly have belonged to that animal, but measures twice as much from every determinate point to another, as a recent full grown hyæna's skull.

"Of the wolf, there are some bones of several individuals There are two large portions of the lower jaw, containing nearly all the teeth in good preservation, and perfectly agreeing in size, in form, and arrangement, with those of a full grown recent animal.

"The os humeri also is perfectly similar, and has the rounded aperture through its lower extremity to receive the curved process of the olecranon.

"A very few small fragments of shell were found apparently allied to the genus *ostrea*; but they are too minute to admit of even that being positively ascertained. A single valve would produce more than all the fragments in question: when applied to the tongue they do not adhere, and their pearly surfaces have all the compactness and lustre of a recent shell.

"Since the above was written, Mr. WHIDBEY has transmitted some additional specimens of the jaws and teeth of the hyæna, the wolf, and the fox, which have been subsequently discovered and from [the] cavity [in which] all the bones of the wolf have been derived. Among these is half of the lower jaw of a hyæna of very superior magnitude to any of those previously discovered, and probably has belonged to the large skull before mentioned.

"The jaws of the wolf are of similar dimensions with those before described; but one of them belonged to a very aged individual.

"Of the fox, there have been found only a few vertebræ, and two canine teeth from the lower jaw, which correspond perfectly in size and form with those of a recent animal; but are equally fragile and absorbent with those of the other animals.

"In a subsequent letter of Mr. WHIDBEY to Mr. BARROW, relating to these last mentioned specimens, dated Plymouth, November 9, 1822, he communicates the following additional information:

"These, I think, will be the last bones I shall send you

'from these caves, as they are now nearly worked out. The
'[second] cave terminated near where it was first seen: the
'head of it was closed over with a body of lime-stone.

'The joints of the rock were not so close but that water might drop down into the cave; and about these joints some stalacites were found in small pieces. I have not seen anything to encourage the idea that the cavern had a communication with the surface since the flood; the present state of the quarries shows nothing like it."*

[Mr. Clift's descriptions were illustrated with 5 Plates, containing 10 Figures of specimens from Oreston. Amongst these were part of the lower jaw of a young wolf, a lower jaw of a full grown wolf of ordinary size, and a lower jaw of a very large hyæna. The first retained its processes, but the last two had lost them, and thus resembled almost all such remains found in Kent's Cavern, Torquay.]

REV. W. BUCKLAND, 1824.

[The late Rev. Dr. Buckland devoted one section of his *RELIQUÆ DILUVIANÆ*† to a description of the Oreston caves and fossils, in which, after briefly recapitulating the substance of Sir Everard Home's papers on the bones found in 1816 and 1820, he gave the following account of the caverns of 1822 :—]

"On this discovery being communicated to me through the kindness of Mr. Barrow, I went immediately to Plymouth accompanied by Mr. Warburton, and found the circumstances to be nearly as follows: In a vast quarry produced by the removal of an entire hill of limestone for the construction of the Breakwater, there is an artificial cliff ninety feet in height, the face of which is perforated and intersected by large irregular cracks and cavities, which are more or less filled up with loam, sand, or stalactite. These apertures are sections of fissures and caverns that have been laid open in working away the body of the rock, and are disposed in it after the manner of chimney flues in a wall; but they attracted no attention till the discovery of bones in them. Some of them have lateral communications with adjacent cavities, others are insulated and single; some rise almost vertically towards the surface, others are tortuous, passing obliquely upwards, downwards, inwards, and in all directions in the most irregular manner through the body of the rock.

* Op. cit. pp. 81-88.

+ Op. cit. pp. 61-88.
† *RELIQUE DILUVIANÆ.* By the Rev. William Buckland, B.D., F.R.S., F.L.S.
Second Edition. MDCCCLXIV. pp. 67-80.

"In almost all the cavities there occurs a deposit of diluvial detritus, consisting of mud and sand, and angular fragments of limestone; these substances sometimes entirely fill up the lower chambers, and are usually lodged in various quantities on the shelves and ledges, and lateral hollows of the middle and upper regions. The composition of the mud, or earthy portion of the diluvium at Plymouth, differs in some degree from that of the cave at Kirkdale, having been derived from the detritus of strata of a different character; it is of a redder colour, and looser texture, and less calculated to protect the bones in it from the access of atmospheric air and water. In one large vault at Oreston, where the quantity of diluvium was very great, it was stratified, or rather sorted and divided into laminæ of sand, earth, and clay, varying in fineness, but all referable to the diluvial washings of the adjacent country. It is often partially interspersed with small fragments of clay-slate and quartz. The sand and loam are in many places invested with, and cemented together by, stalagnite, but not so firmly as in the Gibraltar breccia, and in much of that which occurs in the caves of Germany: portions of bone and single fragments of rock are also found occasionally incased with a thin crust or coating of the same substance; but, generally speaking, it is not sufficiently abundant to hold the mud and bones together in a solid mass after they are moved from the cave. In some few spots there were balls of iron stone, and concretions of ochre found in the clay; in others there was a considerable deposit of manganese ore dispersed through the sand and porous portions of the loam; in the latter were also concentric balls of the same ore enclosed within each other after the manner of the ochreous aërites.

"It was in one of these oblique apertures in the present face of the rock at Oreston, and at about forty feet from the bottom of the quarry, that the congeries of bones, skulls, horns, and teeth I am now about to speak of, was discovered. Mr. Whitby had collected fifteen large maund baskets full of them before our arrival; these have been sent to the College of Surgeons, and distributed to various public collections. In the upper parts of the cavity from which they were taken we saw appearances of as many more still undisturbed, and forming a mass which entirely blocked it up to an extent which we could not then ascertain; those already extracted had been discovered in a hollow, which apparently formed the lowest part of a cavernous aperture descending obliquely downwards. Ascending this aperture from its lowest point,

we pursued it upwards many feet through the solid rock till it became narrow, and was entirely obstructed by a mass of bones, fragments of lime-stone, and mud.*

"The bones appear to us to have been washed down from above at the same time with the mud and fragments of lime-stone, through which they are dispersed, and to have been lodged wherever there was a ledge or cavity sufficiently capacious to receive them, or a straight sufficiently narrow to be completely obstructed by them; they were entirely without order, and not in entire skeletons; occasionally fractured, but not rolled; apparently drifted, but to a short distance from the spot in which the animals died; they seem to agree in all their circumstances with the osseous breccia in Gibraltar, excepting the accident of their being less firmly cemented by stalagmitic infiltrations through their earthy matrix, and consequently being more decayed; they do not appear, like those at Kirkdale, to bear marks of having been gnawed or fractured by the teeth of hyænas, nor is there any reason to believe them to have been introduced by the agency of these animals.

"The only marks I have seen on them were those pointed out to me by Mr. Clift, of nibbling by the incisor and canine teeth of an animal of the size of a weasel, showing distinctly

* "In the course of the summer of 1822, Joseph Cottle, Esq., of Bristol, has made a large collection of bones from this same cave during a visit to Plymouth, and has added the tiger to the list of animals before discovered in it. He has favoured me with the following list of the remains in his possession, and is about to publish a description of them.

18 jaws of horse.

2 jaws of ox.

2 jaws of hyæna.

2 jaws of deer.

5 jaws of wolf.

Single teeth, 188 of horse.

26 of ox.

9 of hyæna.

2 tusks of tiger: one $3\frac{1}{2}$ inches long, the other $3\frac{1}{4}$
one from the upper, the other from the lower jaw.

5 teeth of wolf.

35 of deer.

50 of ox or deer: not ascertained.

"Bones: 300 large and small, chiefly of the horse; none of them are gnawed, many are quite perfect, and the majority of them slightly broken.

"Osseous breccia: 33 specimens, containing teeth and bones cemented by stalagmite.

"From this list it appears that the bones of horse greatly predominate in the collection made by Mr. Cottle: in that sent to the College of Surgeons those of the ox were much more numerous, being nearly equal to those of the horse; but whatever be the disproportion of their numbers, the bones and teeth of all the animals are found confusedly mixed together in irregular heaps, and not in entire skeletons, nor arranged in different parts of the cavern according to the difference of their species."

the different effect of each individual tooth on the ulna of a wolf, and the tibia of a horse; and a few pits or circular cavities produced by partial decomposition on one surface only of the tibia of an ox, exactly resembling those which occur on many of the bones from the cave at Kirkdale.

"These pits must have been formed before the bone was imbedded in the lowest recesses of the cave, and probably whilst it lay exposed in some upper cavity of the rock. The weasels' teeth also must have made their impressions on the bones of the wolf and horse before they were buried in diluvial mud, and probably whilst these dead animals lay in the same situation with the tibia of the ox.

"The bones when half dry, on being thrown out of a basket on the floor, had the smell of a charnel house, or newly opened grave. On examining the spot where they lay yet undisturbed in the mud of the cave, we found some of them decomposed, and crumbling under the touch into a blackish powder, and all extremely tender and frangible, and of a dark brown colour whilst wet; but on drying they acquired a greater degree of firmness and a whiter colour. They retain less of their animal gelatin than the bones of Kirkdale, and when dry they ring if a blow be given to them, and are absorbent to the tongue. On some of them are marks of extensive disease.

"It appears from a description of the Oreston bones by Mr. Clift, published in the Phil. Trans. for 1823, Part i., that those sent to the College of Surgeons belong to the six following genera of animals, viz. *Hyaena*, *Wolf*, *Fox*, *Horse*, *Ox*, and *Deer*; to these must be added the tusks of *Tiger*, discovered by Mr. Cottle. Mr. Clift has ascertained the following number of individuals.

"*Hyænas*, five or six, of the same extinct species as those at Kirkdale; three of them were young, and in the act of changing their teeth.

"*Wolves*, five. Mr. Clift can find no difference between these fossil teeth and those of recent species.

"*Fox*, two tusks, much decayed, and absorbent to the tongue.

"*Horses*, about twelve, of different ages and sizes, as if from more than one species.

"*Oxen*, about twelve, of different species, some having very short and straight horns; but not referable to young animals.

"*Deer*, two or three of a small species.

"No traces of bear or rhinoceros have yet been noticed in

this last discovered cavern ; but this circumstance is an accident likely to arise from the irregular manner in which the remains are now dispersed, and implies no difference in the time or circumstances under which they were introduced.

" It remains only to consider what this time and what the circumstances were. I have already stated, that there is no evidence like that at Kirkdale, to show the animal remains at Oreston to have been collected by the hyænas ; no disproportion in the number of the teeth to that of the bones ; no destruction of the condyles and softer parts, and abundance in excess of the harder portions ; no splinters of the marrow bones ; no friction or polish on the convex surfaces only of the curved bones ; no marks of large teeth ; no album græcum ; and no dispersion of bones along the horizontal surface of a habitable den : but, on the contrary, a deep hole nearly perpendicular, and bones quite perfect, lodged in irregular heaps in the lowest pits, and in cavities along the lateral enlargements of this hole, and mixed with mud, pebbles, and fragments of limestone, in precisely the same manner as in the caves and fissures of Germany and Gibraltar ; and as they would have been, supposing they were drifted to their present place by the diluvian waters from some lodgment which they had before obtained in the upper regions of these extensive and connected cavities. That they are of antediluvian origin is evident from the presence of the extinct hyæna, tiger, and rhinoceros ; but there still remains a difficulty in ascertaining what was the place from which they were drifted ; 1. Are they the bones of animals that were drowned, and their bodies drifted in entire by the waters which introduced the mud and pebbles ? Or, 2, had they lain some time dead on the antediluvian surface of the earth, till they were washed in at the deluge ? Or, 3, were they derived from the animals that had fallen into the open antediluvian fissures, and there perishing, remained as entire skeletons in the spots on which they died, till they were drifted on further by the diluvian waters into the lowest recesses and under-vaultings with which these fissures had communication, and there mixed up, in irregular heaps, with mud, pebbles, and angular fragments of limestone, all falling down together with them to the place of their present interment, and producing in this short transit that quantity of fracture to which they have been submitted ?

" 1. On the first of these hypotheses, had they been drowned, and the carcases drifted in by the diluvial waters, we should have found the skeletons more entire, and the

bones less broken and less confusedly mixed together than they are; and we should neither have had the marks of nibbling by the weasels' teeth on the bones of the wolf and horse, nor the hollow pits arising from partial decay on one surface only of the tibia of the ox; for neither of these effects could have been produced on bones surrounded with a bed of mud.

"2. To the second hypothesis, that they had lain as dead bones on the antediluvian surface till they were drifted from thence into the fissures, I would reply, that in a land inhabited as this was by wolves and hyænas, it is not likely that any carcases would have lain long on the surface without at least the softer portions of the bones being eaten off by the hyænas, and thus we should have found them lacerated rather than perfect, in the place to which they have since been drifted; they might also in this case have been expected to be more or less rolled, and to have lost their angles by friction, which does not appear to be the fact. Another objection also arises from this circumstance, that the bones of dead animals exposed on the surface of the earth, without any protection of soil or gravel, are soon destroyed by minute insects and continual atmospheric changes; and were it not so, the world would by this time have been spread over most abundantly with the bones of the myriads of animals that have died on its surface, and received no burial ever since the period of the last retreat of the diluvial waters.

"3. The third hypothesis is that which I propose as most probable, viz. that the animals had fallen during the antediluvian period into the open fissures, and there perishing, had remained undisturbed in the spot on which they died, till drifted forwards by the diluvial waters to their present place in the lowest vaultings with which these fissures had communication. This explanation is supported by the strong fact, that animals at this day do fall continually into the few fissures that are still open, and that carnivorous as well as graminivorous animals lie in nearly entire skeletons in the open fissure at Duncombe Park, each in the spot on which it actually perished, upon the different ledges and landing places that occur in the course of its descent, and from which, if a second deluge were admitted to this fissure, it could only drift them downwards, and with them the loose angular fragments amongst which they now lie, to the lowest chambers in which the bottom of this fissure terminates. The teeth marks of the weasel, and the pitted surface of the tibia, will on this hypothesis have been effects produced on the

bones as they lay dead within the fissures (for a weasel might find access by minute crevices to the interior of such fissures), and the wolves and hyænas may have either fallen, like the horses, oxen, and deer, by accident into these natural pitfalls, or have been tempted to the fatal experiment of leaping into them to eat the carcases of the other animals, whilst they lay yet undecayed within the fissures. The proportion of individuals collected at Oreston (the graminivorous being very much in excess beyond the carnivorous) is, as far as it goes, consistent with this hypothesis; and if this solution appears fanciful, it is one that need not be urged, for by the same accident that dogs at this day fall into the open fissure at Duncombe Park, no less than sheep and deer, might the wolves and the hyænas also of the antediluvian world have fallen, as well as the horses and oxen, into the chasms which then in countless numbers crossed their paths, whenever they ventured on the perilous regions of the hollow and fissile limestone; and possibly some of them, whilst in the very act of pursuing their prey, may have dashed (like our less ferocious dogs in pursuit of game) into the chasms, which became the common grave of themselves and of the victim they were too eager to devour. And however new and unheard of the existence of such fissures may be to those who have never visited or lived in a country composed of compact limestone, it is matter of painful notoriety to the farmers in Derbyshire, that their cattle are often lost by falling into the still open fissures that traverse the districts of the Peak; and it is no less matter of fact, that similar accidents are avoided in the mountain limestone countries of Monmouth and Glamorganshire only by walls carefully erected round all the open chasms, with which there also the same rocks are intersected.” [pp. 67–80.]

MR. JOSEPH COTTLE, 1829.

[There is in the library of the Plymouth Institution a folio volume, of ten pages only, “On the Oreston Caves, near Plymouth.” It is accompanied by four Plates, several sets of which, the author states, were given to him by Professor Buckland; and he adds that “these Plates constitute part of the many engravings which will be found in Dr. Buckland’s new Geological work.”* The following words occur in each of them:—At the top, “From Mr. Cottle’s Collection;” at the bottom, “G. Scharf del et lithog.” and “Printed by C. Hullmandell.” They contain figures of jaws, parts of jaws,

[* See foot-note, page 5.]

teeth, and bones of "Weasel, Wolf, Fox, Hyæna, Tiger, Water-Rat, Hare, Horse, Deer, and Ox."

The volume has neither title-page nor date; but at the end of the last essay is the signature of "Joseph Cottle," and the following note:—

"The preceding papers on the Oreston Caves were submitted in MS. to an early friend, the late Sir. H. Davy, who so far testified his approbation of the facts, and general reasoning, as to allow of their being dedicated to himself, had they appeared in a detached form. They are now affixed to a few copies of the four valuable plates of Professor Buckland, for the purpose of gratuitous presentation, and constitute the three last Essays in the following work, recently published: 'Malvern Hills, with Minor Poems and Essays, by Joseph Cottle.' Fourth Edition, (with six Engravings) two vols. 12mo, price 12s. in boards."*

As the work is descriptive of fossils collected by the author "in the summers of 1822, 1823," and, as we have seen, he submitted his Essays in MS. to Sir H. Davy, who died May 28th, 1829, the date at which he wrote is fixed within a few years.†

The first two Essays are merely speculative. The third, which alone concerns us here, is as follows:—]

"DESCRIPTION OF THE ORESTON CAVES,
WITH REFLECTIONS ON
THEIR ANIMAL CONTENTS.

"In the summers of 1822, and 1823, the *writer* happened to spend two or three months at Plymouth, just at the time, each year, when the discovery was made of the numerous animal remains which were found in the Oreston Rocks; from the blowing up of which, the *Breakwater* was supplied with stone. The writer felt a deep and almost *enthusiastic interest* excited by the event, and spared neither expense, time, nor trouble, in collecting a large, or rather the far largest proportion of all the animal remains which were discovered in that spot.

"During this protracted period, also, he had an opportunity of inspecting the successive appearances of the rocks, as the destruction of them advanced, as well as of noticing several curious facts, particularly the number, and position of the various caves, with some of which the public are *totally unacquainted*; and which could only have been known to one

* Page 10.

† [Mr. W. W. Stoddart, F.G.S., F.L.S., of Bristol, kindly informs me that Mr. Cottle's 4th Edition of *Malvern Hills, &c.*, was published in 1829.]

constantly on the spot, and directing his attention to the subject.

"The efforts made to *consolidate* this amazing assemblage of animal remains, by becoming the property of *one person*, were attended with some public advantages. The appropriation prevented the remains from being scattered amongst *many individuals*, such as infallibly would have been the case, if these *perquisites of the workmen** had not found one general purchaser. (Any narrow and personal object was the farthest from being entertained by the writer; and after he has retained the *aggregate remains*, long enough to afford geologists an opportunity of inspecting his collection *en masse*, it is his intention to distribute the whole between different public institutions, in such proportions and ways as may best serve the cause of science.)†

"At this moment it is unknown that *two caves* were discovered by the workmen, in the year 1823, abounding with the remains of the *wolf*, exclusively. The author collected (by his agents, who were constantly on the alert) numerous jaws of the *wolf*, from one of these caves. He had directed them, if they found any body of *clay*, however apparently free from animal remains, to examine it to the *bottom*. It then occurred to them, that there was a passage, or rather a long but low *cave*, lying horizontally, about two thirds up the rock, (absolutely *inaccessible*, except to men accustomed to wander about the cliffs, and who could climb like cats) through which they had often passed, (with difficulty, from the *lowness* of the *entrance*) and where they remembered their feet partially *sank in clay*. This they determined upon examining, and the result was, that they brought the writer, in *two days*, no less than *forty jaws* of the *wolf*, which were completely embedded in this *clay*, and, for the most part, in a high state of preservation.

"The second cave, containing the remains of the *wolf*, was discovered, after the great cave was destroyed. Contiguous

* "The writer, upon reaching Plymouth, wishing to possess some specimens of the Remains found in the Oreston Caves, in company with a friend, applied to one of the two Government Agents, who informed him that *he* had none, but that I might be supplied through some of the men at the quarry.

"These men were glad to find a purchaser for articles which they often risked their necks in obtaining. Two of them informed the writer, (where there could be no motive to deceive) that, before they knew that any value was attached to these *Bones, Jaws, and Teeth*, they had thrown amongst the rubbish, as much as *Two Cart-loads* of all sizes and descriptions!"

† [The following note, in MS., occurs here], "This collection has recently been presented to the Bristol Institution, Park Street. J. C."

to it, and about twelve feet lower down, an *aperture* was observed by one of the men, not more than sufficient to admit an individual at a time, through which he, and a companion, descended, when their candles enabled them to make the following observations. The cave was about fifteen feet square, and without clay. Beneath a large stone, that had fallen from the roof, diagonally, they noticed *numerous* small bones, lying in parallel rows. These they collected to the number of *two hundred*, (without a fracture in any part of them) and evidently remaining in the same spot in which the animals had perished. These proved to be the phalanges of the wolf, and the whole of which are now in the writer's collection.

"But there was one other singular discovery made in this cave. All the other bones, not defended by the shelving rock, had been exposed to the continual dropping of water, and, with the falling in of stones from the roof, had become crushed, or decomposed, uniting with the stalagmitic matter, till the whole formed one amalgamated dense *breccia*. The men, on account of the facility of conveyance, broke the mass into convenient portions, *seventy* of which they preserved, and then, with their large hammers, (a true *biblio-maniac* spirit) *destroyed the whole of the remainder!* These seventy specimens of *Oreston Osseous Breccia* are now in the writer's possession, except one of them, which was requested for the Museum of Oxford.

"A few observations on the Oreston Caves are subjoined.

"OBSERVATIONS.

"1st. The cave where the chief animal remains were found, was about twenty-one feet deep, (proceeding at right angles from the arm of the sea, called '*Cat-Water*,' fronting the rocks) about twelve feet high, but variable, and about ten feet wide at the entrance.

"2nd. The cave, containing the remains, was about thirty feet above the level of the sea, and the superincumbent rock rose above the roof of the cave, about sixty-five feet; so that if twelve feet be allowed for the height of the cave, and thirteen feet for the overburden, it will show the altitude of the rock to have been about one hundred and twenty feet.

"3rd. The excavations which had been made by blowing up the solid rock, to the spot where the cave was discovered, was about six hundred feet.

" 4th. The sides of the cave, in numerous places, were incrusted with a nebulous stalactite, the protuberances of which were about the size of small pease, and all of them were tinged with the red colouring matter of the rock.

" 5th. The Oreston Rocks consist of secondary transition limestone, forming a *marble*, which is susceptible of the finest polish, and is plentifully diversified with red and white veins.

" 6th. The base of the cave was covered with a clay-like mud, approximating to the colour of red, from the oxyde of iron, with which it was impregnated, and resembling the earth on the summit of the rock.

" 7th. On this stratum of clay, lay a proportion of the bones, (though preponderating by *the sides*.)

" 8th. The clay which thus covered the base of the cave was about one foot deep at the entrance, and about three feet deep in the interior.

" 9th. The upper surfaces of the bones, which were, in some degree, subject to the operation of the air, presented a light appearance, consisting, almost entirely of the phosphate of lime. The under surfaces of the bones, which were embedded in the clay, were of a darker colour, and had not wholly lost their animal glutine. The latter parts, also, were more compact than the former.

" 10th. Though the greater portion of the bones lay promiscuously scattered over the surface of the clay, or had but partly sunk into it, many others were completely immersed. The existence of these latter bones, was not, at first, suspected.

" 11th. Though the bones which were wholly buried in the clay were harder than those which were acted upon by the air, yet very few of the bones or teeth, exhibited a complete state of fossilization. Many of the bones, and teeth, are partially fossilized, but they are those alone which were exposed to the percolation of water, when they often became incrusted with stalactite, and submitted, in different degrees, to the sparry transformation.

" 12th. There was no stalagmite in the cave, nor any stalagmitic concretion on the surface of the clay, such as was found in the Pickering Cave.

" 13th. Very few stalactites appeared in the cave. The writer obtained one, singularly pure and beautiful. It is eight inches long, and eleven inches in circumference at its base.

" 14th. The teeth which approached the nearest to a fossil state were incapable of *cutting glass*, from having been embedded not in silicious, but in the softer calcareous matter.

"15th. The bones obtained by the writer preponderated greatly in favour of the *horse*.*

"16th. Nearly all the jaws obtained by the writer, were found immersed in the clay. From having been thus circumstanced, the process of decomposition was necessarily retarded. The jaws of the *wolf* greatly preponderated.

"17th. Independently of the preceding teeth, jaws, and bones, the writer obtained from the same cave, the jaw of a horse, with many of the teeth, combined with bone and earthy concretions; and particularly with the lower ball of the femur of the boss [*sic*]; all petrified.

"18th. In opposition to the opinion, that our indigenous horse was smaller than the existing race, the bones of the horse obtained from this cave appear to be fully equal to the recent animal, if not larger. A tibia, at its upper extremity, measures 14 inches in circumference.

"19th. One tibia is fractured nearly at its centre, and presents the following appearance. After its fracture, it must have remained in a perpendicular position, which allowed the water from the roof to drop *into* the interior of the bone, for the whole cavity is filled with stalactite nearly as spherical as pebbles. A similar bone, fractured also in the centre, exhibits its cavity filled with nebulous stalactite, similar to that which covered the sides of the cave.

"20th. There was, originally, a large aperture in the roof of the great cave, but at the time when the cave was opened it was completely closed with stalactite, stones, and the occasional intermixture of bones; the whole strongly cemented, and bearing a resemblance to the Gibraltar Breccia.

"21st. This roof of the cave could be removed only by being blown up with gunpowder. All the petrified jaws of the horse, in the writer's possession, (28 in number) were obtained from this roof; and which, at some former period, was evidently *open*.

"22nd. Not one of the bones presents the slightest evidence of being *gnawed*.

"23d. Although only one fissure *appeared* to communicate with the cave, there was more than one opening, or fissure,

* The jaw of the horse is furnished with the *alveolar processes*, or cavities, for receiving 40 teeth; 12 incisor teeth (6 in each jaw), 4 tusks, and 24 grinders (12 in each jaw). The tusks in the horse are not shed, neither are the three pairs of posterior grinders. A general resemblance exists between the teeth of several of the carnivorous animals, although there are characteristic differences, with which naturalists are familiar; but when jaws are to be seen, the inexperienced will find a solution in the number of the teeth. Thus the tiger and the bear have only *three* molar teeth in each side of the lower jaw, whereas, the hyena has *four*, and the wolf *seven*.

in its immediate vicinity, branching off diagonally, in some unexpected direction.

"24th. One mass of breccia, obtained from the spot, exhibits on its *surface* the tibia of a horse, the femur of the boss; various other bones, with a fine molar tooth of the hyæna, projecting; and the organ of hearing of the horse; all cemented together by stalagmite. Its *interior* contents cannot be known.

"25th. Immediately above the small cave was compact rock. This cave contained no animal remains.

"26th. The fissure connecting the two caves, appeared to be about six inches wide, and bore a strong resemblance to the crack which is often to be observed in the settlement of a new house.

"27th. A singular appearance offered itself in this spot. The Oreston Rocks consist of a *red marble*, *without* any organic remains, yet, at their eastern extremity, and separated only by a small inlet, rocks of *black marble* present themselves, abounding *with* organic remains. This black marble appears, also, on the opposite side of the river *Lara*. In this neighbourhood may be seen the extraordinary and abrupt conjunction of the *slate* and *limestone* formations.

"28th. The stratum of red clay was about twenty feet from the summit of the rock; about thirty feet long and six wide. It lay nearly horizontal; was perfectly straight; and was surmounted with solid rock.

"29th. About twenty-five feet to the left of the large cave, a mass of clay appeared. Its sides were irregular. In its extreme points, it was forty feet long, and thirty deep. In this clay, insulated as it was by rock, the following appearances were exhibited. In its left hand extremity, where it came in contact with the solid stone, its substance, as well in colour as in hardness, approached so nearly to the adjacent rock, as scarcely to be distinguished from it. The opposite extremity of this clay, on the contrary, was soft, though tenacious, of a dark brown colour, and easily dug out with a *spade*. The intermediate space, between these two extremes, presented a regular gradation of colour, from a light, to a dark brown, and from rock, to the softest clay; so that, between the first and the last series, there was a manifest variation, although no two parts, immediately contiguous, could have been selected, as possessing contra-distinguishing appearances, or solidity. The whole of this clay is now destroyed. At the bottom of it, a stratum of red *sand* was discovered, (some specimens of which have been preserved.) It had no marine admixtures. In this mass of clay, a diversity of veins ap-

peared, extending over the whole substance, in all the convolutions of the marble in which it was embedded. Some specimens were preserved, containing those incipient veins; and the whole seemed like clay not yet *indurated into rock*.

"30th. Immediately under the large cave, and on a level with the ground, some cavernous apertures appeared, which, however, had no connexion with the principal cave. This natural excavation contained neither clay nor animal remains.

"31st. Many of the bones, and particularly those which were most defended from the air, retained much of their animal glutine, as when they were exposed to heat, in a pulverized form, the *empyreuma* effluvia was very perceptible.

"Remains obtained by the Writer, from the Oreston Caves."

	Jaws.	Molars, Fangs, and Incisors	Teeth
Tiger . . .	2		11
Hyæna . . .	5	ditto ditto ditto	35
Wolf . . .	86	ditto ditto ditto	225
Fox . . .	8	ditto ditto ditto	6
Horse . . .	32	ditto ditto	800
Bull . . .	5	ditto ditto	400
Deer . . .	6	ditto ditto	100
Boar . . .	1	ditto ditto	
Hare . . .	2	ditto ditto	5
Water Rat .		ditto ditto	2
Weasel . . .		ditto ditto	3

Jaws 147 Teeth 1587

Bones, from the Tiger to the Hare	500
Ditto, fragments without direct character	1000
Ditto, Vertebre	250
Ditto, Skulls, and portions of Skulls	26
Horns, (Bull)	3
Osseous Breccia (masses of)	80
Album Græcum	1

"To the preceding cursory remarks, the writer will now venture to offer an opinion, illustrative of those animal remains; which he adopted, from a deliberate view of the Oreston Rocks; the precise spot where the caves lay; and the adjacent land; not advanced in the spirit of arrogance, but with a desire to offer a few suggestions for the consideration of others, and thus, in some degree, to promote the discovery of truth.

"In his repeated inspection of that portion of the Oreston Rocks, where the caves lay, the writer was struck with the

loose, shattered and incoherent character of the whole region. He inquired of some of the workmen, *practical men*, and one or two of them, unusually acute, who had no opinion to foster, nor theory to respect, and they all concurred in stating, that this part of the cliffs was "looser," and "more broken;" and far more easily "worked," than any other parts of the rock.

"Another fact to be remembered is the following. The workmen had blown up, in this direction, 600 feet of solid rock, without meeting with a single cave. They had now almost worked the rock *through*, in a right angle, from *Cat-Water*, and had nearly arrived at the earthy soil beyond, when they found the various caves in question. This point was ascertained by the writer passing some miles round, so as to reach the summit of the rock, directly over the caves. The fact then became established, that the rock was nearly *expended*, and one very observable appearance presented itself. The reader, from anything he has heard to the contrary, has, probably, supposed that, beyond the Oreston Rock, (now nearly *worked through*,) there was a continuance of equally high ground; but the direct reverse is the case; the land *behind the rocks*, makes a rapid dip, or descent, down to the village of Oreston, on the margin of the sea.

"While contemplating, *on the spot*, these two facts, the writer's mind was deeply impressed with the persuasion that in some former period there must have been an *horizontal opening*, or cavern, on the side of the hill, near the top, which was connected with these caves, and through which the animals may have passed, till they fell into the caves, from which there was no retreat.

"What! it will be replied, "Wolves, tigers, and hyænas, with all the other animals; is it to be supposed that they, in an amicable body, passed through this imaginary aperture, or cavern, to reach the further caves, in order to leap down, and be destroyed?" This opinion, like many others, may appear absurd, till ulterior circumstances are made known. If such an opening as is here suggested ever existed, and that it did, is to be inferred, because,—1st, the thing in itself is probable, from the broken, and disjointed nature of the rocks, and,—2ndly, because there is no other *rational way* of accounting for the presence of these diversified animal remains.

"The writer must now state it, as his conviction, that all the animals, found in the Oreston Caves, were absolutely drowned by the waters of the *Deluge*; of which catastrophe, these animals furnish the strongest presumptive evidence."

[The author then proceeds to furnish the reasons which,

as he supposes, "support this opinion ;" and then proceeds thus :—]

" To the supposition, here entertained, of an aperture in the sloping side of the hill, conducting to the caves in which the animal remains were deposited, perhaps it may be remarked, that no such opening has been discovered. This fact is admitted, but present appearances lead to no conclusion, as to the past. The aperture may have been filled up, either by the immediate action of the Deluge ; the mouldering effect of the elements, or that progressive accumulation of alluvial soil, which has transformed innumerable other portions of the earth's surface.

" Surprise has often been expressed that *human bones* are not occasionally discovered, intermixed with those of animals. But it must be recollectcd, that, in the district now constituting England, in all probability, not a human being was to be found at the time when these animals perished. The whole region was, doubtless, given up to the dominion of the "beasts of the field." On the supposition that all the animals were destroyed at the time of the Deluge, whose remains are found in the Oreston, and many other caves, and that the separation of England from the continent occurred at the same period, one consequence would necessarily follow. The channel of communication being effectually cut off, if the indigenous ferocious animals were once extirpated, no successors could ever be found here : now facts support this reasoning. Tigers, hyænas, &c. have become extinct in this island ; nor, from the time of the Deluge, down to the present moment, has a single instance occurred of any of these animals being discovered here, in a wild state, though at, and prior to the Deluge, from their innumerable *excavæ*, they must have abounded.

" It was before intimated that no *rational* solution could be given for this huge assemblage of animal remains in the Oreston Caves, but upon the presumption that there was some *horizontal* channel that led to the caves, near the top. To substantiate this remark, it will be necessary to offer a few brief comments on the four hypotheses which have been advocated by different speculators on the subject, although only the two last will be deemed worthy of an extended notice.

" 1st. 'A passage from the tide above high-water mark.'

"To this supposition it is only necessary to state three objections.

"*First.* Rocks are not organized bodies and consequently do not *grow*. If an avenue, six hundred feet in length, ever existed, it could alone have been filled up by calcareous spar or stalagmite, no traces of which have appeared. *Secondly.* It could not have been the den of wild beasts, where the larger animals were dragged so far, and carried so high up in the *rocks*, and all in total darkness; and *thirdly*; if it was a mere avenue through which carnivorous animals proceeded to their ultimate dens, they must often have passed each other in amicable confraternity!

"2ndly. It has been conjectured, by others, that, in some great natural convulsion, the rocks 'collapsed,' and thus enclosed these animals. So futile an argument can only be answered, by supposing that tigers, hyænas, wolves, and horses, &c., &c., on some felicitous occasion agreed to suspend their animosities, where they all assembled, in grand concert, on some deliberative occasion, just at the *very place*, and in the *very moment*, when the rocks opened, and swallowed them up!

"3rdly. It has been suggested that these caves were the dens of wild beasts, approachable, not from the base, but the summit. If this had been the case, the dens would not have belonged to *wolves*, but must have been appropriated to the stronger, or rather the *strongest* animals; namely, *tigers*. Tigers and hyænas could no more have coalesced than oil and water. Now, it is well known that tigers never inhabit other than thickets, or shallow dens. To suppose that tigers could have dragged into these caves, innumerable bulls, horses, and hyænas, and *that* by a perpendicular descent, down into the interior and dark recesses of the rocks, is as wild and visionary a presumption as theorists can well devise. In this case, tigers (those *cautious* animals,) must courageously have leaped from prominence to prominence, dragging their ponderous loads after them. And another appalling difficulty then arises, in determining how they are again to *ascend*, when they were to seek their prey; and also, in what way they were to teach this science of *vaulting* to their *young*!

"4thly. The next and most feasible supposition, is, that the animal remains, in question, fell into these fissures, or natural openings in the rocks. Those who reject the writer's idea of some horizontal passage, are obliged, in this case, *themselves*, to adopt a theory far more strange and adverse to present appearances than the one they oppose. Seeing

that the bones must have reached the caves, *in some way*, they venture to *assume* that there was a chasm on the summit of the rocks, but the closest inspection, and the minutest enquiries, establish the fact that there was not the *least sign* that any such opening *had ever existed*; so that the writer's conjecture of some unexplored horizontal channel, that led to these interior caves, becomes the *least* of two difficulties!

"Before a correct judgment can be formed, the reader must be aware, that directly under the loose rubble which the workmen call the "overburden," *an unbroken stratum of rock extended*, covering the whole surface of the Oreston Cliff, so that (to use a familiar, but apt illustration) the caves were all covered up, like the crown of a *baker's oven*. This being the undeniable fact, the supposition here advanced, of some *horizontal* approach to the caves, is not only the *least* of two difficulties, but seems to be the only expedient that *can* be devised for crowding these caverns with the animal remains. It may be decided by a plain syllogistic argument: Here are extraneous bones. They must have proceeded to their present position by one of three ways. They must have proceeded from *beneath*; or, from *above*; or, from the *sides*; and no doubt can be entertained, but that, if a vigilant attention had been directed to the *extremity* of the rock, the suspected aperture (some traces of it, at least,) *must* have been discovered.

"This part of the enquiry is of so much importance to any correct judgment on the question, that it must be dwelt on a little longer. The writer's observations (continued through a good part of two years,) combined with the testimony of all the operative men engaged in blowing up the rocks, confirmed one fact, that, immediately surmounting the caves, and extending universally over the Oreston Cliffs, there was one *unbroken stratum of solid rock*; whilst from the caves, *backward*, to the slope of the hill, the stone was more broken, and the caves and apertures more numerous, till the whole terminated in the diluvial soil.

"These are statements, incontrovertible. No one, conversant with the spot, has ever, for a moment, adopted the opinion, from specific appearances, that there was any chasm, or opening, on the crown of the rock. Speculators, at a distance, have presumed that it *must* have been so, in opposition to undeniable proof to the contrary; but they erred in not knowing, or forgetting, an obvious alternative, that, as an approach from the summit was completely excluded, there might have been a collateral *side entrance*; such

as is here contended for. This opinion is not only probable, from the nature of the rock, and the ground, but is supported by the *impossibility* of the caves being approached *in any other way*.

"This inference will be found the more legitimate, when it is considered, that if there *had* been a chasm on the top of the cliffs, it could not have been concealed, or filled up. The sides of a large rocky aperture never could have approximated; and if the Deluge, or any other convulsion of nature, had filled the orifice, or *upper cavity*, (for it could have done no more) the extraneous matter would have formed so striking a contrast to the matter of the rock, as to attract the quarry-men's immediate notice.

"All reasoners on the subject must unite in one conclusion, that, whether the opening that led to the caves was on the top of the rock, or, more horizontally, from the side, immediately after the bones were deposited, all access to them must, almost, hermetically have been sealed, or otherwise the process of decomposition, from atmospheric influence, would instantly have commenced, and rapidly have proceeded.

"Some confirmation of the unusually disrupted state of that portion of the rock, where the caves were found, may be collected from the innumerable *fissures* through which the rain descended, and which carried down to the animal remains a large portion of the red superficial soil, (augmenting through successive ages,) till, at last, the far larger proportion of the remains were completely embedded in this humid, tenacious clay. From the increasing filtration of rain and springs, the caves universally were more than *damp*; they were *wet*.*

"This 4th supposition being that which has been adopted by so many, groundless as it is, must receive a further consideration.

"In order to found some reasoning upon it, the gratuitous admission shall be made that there *was* this chasm on the apex of the rock, directly surmounting the caves, but it will be shown that the subject is still encumbered with insuperable difficulties.

"The approach to the caves, from the surface of the rocks, must have been large, or small; direct, or winding. If it was small and winding, the bones would soon have been obstructed. If it was large, and direct, it is true the whole

* "The writer directed the men to bring the *remains* to him, and particularly the *jaws*, as they were found, imbedded in the clay; when, by carefully washing off the earth, many a fracture was prevented, and, what was of more consequence, the *teeth* of the jaws were *all preserved*."

animals may have fallen in, and been dashed to pieces, but the chasm, if large, was not direct, further at least than the first cave, where there were no animal vestiges: independently of which there were various caves, lying on the same level as this, in which there were remains, but those exclusively of the wolf. Forty feet below these, the great body of bones were found; and, those, all of the larger animals. Down to this spot there are good reasons to believe that there may have been nearly a direct descent; but this is not conquering the difficulty.

"It may be asked, How came so immense an assemblage of animals, of different genera and natures, voluntarily to bound into this fearful chasm, to their destruction? Is it the practice of wild animals to lose the sense of fear, and, heedlessly, to leap down in the dark, not knowing, or caring, whether their descent were five or fifty feet? The reverse is the notorious fact, and rare indeed is the instance of any animal, even the *graminivorous*, falling into a manifest fissure. Their instincts are quite as strong to avoid danger as those of men: yet here are animals, of different names and habitudes, who must have plunged down, headlong, in *droves*, for the mere pleasure of breaking their necks.

"But there is another important view of the subject. This chasm, supposing it to have existed, must have been the receptacle, for unknown ages, of a succession of unfortunate animals, who gambled about the orifice of danger, and, for their temerity, paid the forfeiture of their lives. In this case, one effect must necessarily have presented itself. The bones would have been found *in different stages of decomposition*. Now the observable fact is, that *all* the bones, in *all* the caves, bore precisely the *same appearance*, and clearly evidenced that the animals to which they belonged, must have perished, universally, at *the very same time*. Does not this emphatically point out the Deluge?

"But perhaps, it may be said, 'The animals were probably washed in *at the Deluge*.' This is an inadmissible conjecture; for, in the first place, it would be preposterous to suppose this orifice more than three or four yards in extent. At the period of the Deluge also, when the 'windows of heaven were opened,' all caves, with exposed apertures, must have received the drenching rain, and, where, as in this case, there was no eject, have been soon filled to running over. And this, it should be remembered, must have taken place, before the waters in the valleys accumulated, and aroused the fears of the animal race. The caves, therefore, being inundated, to

their brim with water, this tremendous opening, which was to receive such floating myriads, would have appeared only like a *small pool*!

"It may further be remarked that, if a few stray animals had fallen into this cavity, filled as it was with water, their specific gravity is so near to that of the liquid in which they were immersed, that *if* they had been drowned in this small sheet of water, (a contingency hardly to be admitted,) they would scarcely have *sunk*, and soon after would have *floated*, (had time allowed) from the internal generation of air, when they would have operated as a *warning* to other animals. This idea of filling the Oreston Caves with remains, by the animals being 'washed in at the Deluge,' it is presumed will now be relinquished. But there is one other supposition which has often been advanced. Some suppose that the bones, in some unaccountable way, fell into the *cave*, or caves, *from above*.

"It may here be asked, What possible combination of circumstances could have brought to the immediate vicinity of this orifice, such an immense collection of animal remains? If they had been found only at a *little distance* from the opening, there they would have reposed and perished. The scoria that issues from a crater, never returns to it again. If this apprehended chasm had lain in a valley, surrounded, like a tunnel, with shelving rocks, winds and torrents might have brought into it, as into a focus, all the bones that were scattered on their sides: but the very observable fact, is, that, instead of this convenient valley, and these shelving circum-ambient rocks, the whole upper surface of the Oreston Cliffs, presented one *down-like level*.

"The author having expressed his sentiments on the four current hypotheses respecting these animal remains, and shown a few only of the difficulties with which they are encompassed, he must now finally remark, that he is increasingly convinced of the necessity of allowing the *horizontal* approach to the caves before contended for. This theory obviates all objections, and is far more reasonable than any other.

"Instead of being intricate, the process is clear, and the result just such as admitted facts warrant. He must again repeat, that the *Deluge* is the only solution to these animal appearances, and no one phenomenon presents a fuller attestation of that overwhelming catastrophe than the innumerable animal remains discovered in the Oreston Caves.

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"It has been the author's wish, in detailing his *opinions*, to abstain from all undue confidence. There is no prohibition against expressing new views, where the old ones are unsatisfactory, but, whenever substantial reasoning shall disprove any position which he has ventured to advance, no individual will become more promptly opposed to it than himself. The greater the body of thought and observation, which is brought to bear on this *very curious* subject, the more likely it is that truth should be elicited, and if the end be accomplished, the medium which conducts us to it is of slight importance."

"JOSEPH COTTE."

[The list of remains found at Oreston supplied by Mr. Cottle to Dr. Buckland (see p. 262, above,) differs in two particulars from that in his own Essay :—The latter contains the names of five species of mammals (Fox, Boar, Hare, Water-Rat, and Weasel) not found in the former, and the numbers of jaws and teeth in it are in all cases the most numerous.

The facts may without doubt be thus explained :—The former was compiled whilst Mr. Cottle was still adding to his collection, and the latter after he had ceased to do so. To facilitate comparison the two lists are here given together :—

	<i>Reliquiae Diluvianæ.</i>		<i>Cottle's Essay.</i>	
	Jaws.	Teeth.	Jaws.	Teeth.
Horse	18	188	32	800
Ox	2	26*	5	400
Hyæna	2	9	5	35
Deer	2	35*	6	100
Wolf	5	5	86	225
Tiger .....	...	2	2	11
Fox .....	...	...	8	6
Boar .....	...	...	1	...
Hare .....	...	...	2	5
Water-Rat ...	...	...	...	2
Weasel .....	...	...	...	3
 Totals...	29	265*	147	1587

A corresponding increase is seen in the number of Bones, and it is perhaps noteworthy that Mr. Cottle mentions one mass of Album Graecum, and three teeth of Weasel. The identification of the latter was obviously accepted by Dr. Buckland as he has figured them in the first of the four plates given by him to Mr. Cottle (see figs. 14, 15, 16).

The occurrence of the Weasel's teeth is of considerable

* [In addition to these, 50 teeth of "ox or deer," are given in this list.]

interest when taken in connexion with the two or three impressions of the incisors and canine teeth on the radius of a young wolf, pronounced by Mr. Clift to be those of "some animal of the size of a Weasel." (See p. 256, above.)]

REV. RICHARD HENNAH. [1822-1835.]

[The following brief remarks on the Oreston caverns occur in Mr. Hennah's "Succinct Account of the Lime Rocks of Plymouth."*]

"It may be requisite that I should not pass over in silence, and without notice, the Fossil Bones, which, from time to time, have been found in the Breakwater Quarries, at Oreston. Of those of former discoveries, a full and particular account has already been given by Joseph Whidbey, Esq. in the Philosophical Transactions of the Royal Society.

"And, of the Fossil Bones and Teeth, which have been very recently brought to light, in the further progress of working those Quarries, it would be premature in me to say much, or to offer an opinion on the subject; as they have been put for examination into the hands of Gentlemen, who are much more competent to the task, and from whom the Public may with confidence expect an interesting description.

"In quantity they filled several large baskets, and belonged to many animals. Amongst others, might be distinguished the teeth of an extinct species of the hyæna, and those of the wolf;—the teeth of the deer, the cow, and of the horse;—but, neither the bones nor the teeth of any of the larger class of animals, such as the elephant, or rhinoceros, were met with. They were enveloped in a mass of apparently black mould and clay, in rather an extensive hollow or cavern, situated thirty feet from the bottom and sixty feet from the surface; the face of the rock being about ninety feet, in perpendicular height. There is reason to suppose also, that it will be found, that the cavern has a communication with the surface.

* ["A Succinct Account of the Lime Rocks of Plymouth; being the Substance of several communications, read before the Members of the Geological Society, in London, and partly printed in their Transactions. By the Rev. Richard Hennah, Chaplain to the Garrison of Plymouth. Plymouth."

The work is without date, but the chapter here quoted was in all probability written after the discovery of the bones at Oreston in 1822, for Mr. Hennah speaking of them, says, "they filled several large baskets," (p. 65), and Dr. Buckland says of the bones found in 1822, "Mr. Whidby had collected fifteen large maund baskets of them" (*Reliq. Diluv.* p. 71). It was certainly written before 1835, since "*Philophysicus*" quoted it that year. (See *South Devon Monthly Museum*, vol. vi. p. 221.)

"In some instances, they were cemented together by stalactitical matter, and formed one mass, with fragments of the rocks, and the substances with which they were surrounded. They generally retained their original form and appearance, and to common observation, they were very similar to bones that have been long buried in the earth. Whether, however, their substance may not have undergone a material change, since they were first deposited in the situation where they were discovered, I am not prepared to say : perhaps this will be found to be the case ; which, with other circumstances, will help to ascertain in some measure their probable age.

"It should seem, from the very considerable quantity that has been collected, as if they had been brought here at different times, since the first formation of the rock, by the beasts of prey which occasionally took possession of the cavern, and made it the place of their retreat. This conjecture is much strengthened by the shattered appearance of the ends of many of the bones, and the sharp splinters, which are in great numbers, and seem as if they had been gnawed, and broken by the teeth of some animal. But, as to their being *antediluvian* or not, or to what period of the world they ought to be assigned, I shall leave to those who are better informed than myself, to determine." [pp. 64-7]

"PHILOPHYSICUS" (MR. J. C. BELLAMY) 1835.

[In the Sixth Volume of "The South Devon Monthly Museum,"* there are three articles entitled "Fossils of the Neighbourhood," and signed "Philophysicus." These were subsequently claimed by Mr. J. C. Bellamy, in his "Natural History of South Devon," p. 84. The articles are mainly devoted to the Cavern at Yealm Bridge, about eight miles from Plymouth, and to speculations suggested by its phenomena. Occasionally, however, there are incidental remarks on the Oreston caverns ; and these, though they add little or nothing to our knowledge on the subject, are given below :—]

"Altogether, the facts collected [in the Yealm Bridge Cavern] bear a curious and striking analogy to those connected with the Oreston caves and others of a like description. There are, however, some circumstances which differ. . . . It seems that the Oreston caves . . . contained relics such as have not been meet with here—these are—bones of the elephant, deer, and tiger." [p. 124]

* "The South Devon Monthly Museum," volume vi. July to December 1835. Plymouth.

"We are led to believe that the Oreston caves exhibit no proof of having been used as dens." [p. 219.]

"It is Dr. Buckland's opinion, that the animals, whose remains have been found here, [Oreston] were destroyed by falling into these fissures whilst hunted, in the case of the ox, horse, &c., and whilst hunting, as in the case of the tiger, or hyæna; that their carcases were deposited for the time, on some projecting ledge of rock, and were subsequently conveyed at the time of the flood deeper into the hollows: but the same flood which drifted them, drifted also blocks of limestone, pebbles, and solitary bones into the same situation. I think it is a general rule for caves of this class, having openings from above, to present, in these passages, irregular blocks of stone; at least such was the case at Oreston Mr. Hennah states that, in the last discovery of bones at Oreston, none of the very large animals were observed; and Dr. Buckland, also, in his work, does not enumerate the elephant and hippopotamus; but I have seen both of these, and likewise fragments of the skeleton of rhinoceros, from thence, procured in 1822." [p. 221.]

MR. BELLAMY, 1839.

[The following brief notice of the Oreston caves occur in the late Mr. Bellamy's *Natural History of South Devon**] :—

"The Oreston caves investigated by Mr. Whidbey who published their description in the Philosophical Transactions, are thought by Dr. Buckland to contain the remains of antediluvial animals which had perished by falling over the precipice of the caverns, whilst hunted in the case of the horse, ox, &c., and whilst hunting, as in the case of the tiger, or hyæna; he thinks their carcases were deposited on the projecting ledges of rock, and were afterwards carried by the Flood, together with various diluvial matters, deeper into the recesses. Dr. Buckland and Mr. Hennah in their respective works affirm or imply that no bones of the larger mammals occurred in these caves. They are however both in error, as I have bones of the elephant, rhinoceros, and hippopotamus from this locality in my possession. I conceive these fragments were washed down amidst the diluvial matters. De la Beche observed that the remains were always collected at the bottom, and beneath large accumulations of fragments of rock. As I had no opportunity of examining the Oreston caves, I can offer no decisive judgment on the somewhat

* ["The Natural History of South Devon." By J. C. Bellamy, Surgeon. MDCCXXXIX.]

contrasted opinions of Buckland and De la Beche, in respect of the phenomena they presented.

"I have lately received from Oreston a curious tooth, which I am not able to assign to any species of animal; it was taken out of a small fissure of the rock, unconnected with those caves in which the great assemblage of bones just alluded to was found. This tooth is represented in a wood-cut. [pp. 82-3.]

"Besides the occurrence of *ovine bones* at Yealm Bridge and at Berry Head, they were found amongst the accumulation at Oreston; ovine teeth from thence are in my possession. Their presence among our fossil bones constitutes a peculiarity in the geology of this district." [p. 440.]

SIR H. DE LA BECHE, 1839.

[In his *Report** the late Mr. (afterwards Sir Henry) De la Beche has the following brief remarks on the Oreston fissures]:—

"The Oreston ossiferous fissures have at different times been laid open during the excavations there made, chiefly to furnish blocks of rock for the breakwater at Plymouth. The first were described by Mr. Whidbey in 1817, and again in 1820. In 1822 Dr. Buckland described a large ossiferous fissure then laid open during the progress of the quarry, and pointed out that the rock was subject to fissures, as frequently happens in limestone rocks of that character and age, and that some only of these fissures were ossiferous, while the greater part of them were more or less filled by loam, sand, or stalactite. The quantity of bones which have been taken from these fissures has been collectively very considerable. Many minor ossiferous fissures have not been publicly known, the workmen selling the bones as soon as they discovered that it became profitable to do so. Many even appear to have passed unnoticed, for in one of our visits to the Oreston quarries we obtained two teeth of a rhinoceros at the bottom of a narrow fissure, amid a dark clay, apparently impregnated with animal matter, in an old unnoticed part of the excavations. Considerable angular masses and smaller fragments of limestone often occur in the ossiferous and other fissures, and it can be readily understood that, before these cracks became filled by fragments detached from the sides and by the loam and sand, multitudes of animals ranging the ground above could have fallen into them, more particularly when

* ["Report on the Geology of Cornwall, Devon, and West Somerset." By HENRY T. DE LA BECHE, F.R.S., &c. 1839.]

chased by beasts of prey, often themselves the victims of their own eagerness and voracity, either during the chase or when the dead animals were visible in the fissures. Dr. Buckland suggests that the proportion of individuals found at Oreston, the graminivorous being very much in excess beyond the carnivorous, is consistent with an hypothesis of this kind." [p. 413.]

MR. J. CLARINGBULL, 1840.

[In his "Guide to the Plymouth Breakwater,"* Mr. J. Claringbull makes the following remarks on the Caverns]:—

"In working the quarries, in the years 1816, 1820, and 1822, some extensive caverns were opened, in which were found some curious organic remains. In the former instance, a quantity of fossil bones of the rhinoceros were found, and in the other caves, bones of the elephant, horse, ox, deer, tiger, hyæna, wolf, sheep, fox, rabbit, and several smaller animals were discovered. To explain how, or at what period, these remains became embedded in these fissures, would lead me into a subject, on which the opinions even of the most able geologists differ; and being a matter on which I could only repeat their different theories and conclusions, I must refer my readers, who may be interested in the inquiry, to some remarks contained in the 6th vol. of the South Devon Monthly Museum, in which the caves are particularly referred to. I may, however, be allowed to remark, that it is Dr. Buckland's opinion, 'That the animals, whose remains have been found here, were destroyed by falling into these fissures whilst hunted, as in the case of the ox, horse, &c., and whilst hunting, as in the case of the tiger or hyæna; that these carcases were deposited, for the time, on some projecting ledge of rock, and were subsequently conveyed at the time of the flood deeper into the hollows; but the same flood which drifted them, drifted also large blocks of lime-stone, pebbles, and solitary bones into the same situations, and eventually closed the mouth of the fissure! This, appears to be very probable, as the large mass, covering the highest cavern in the quarry, consisted only of loose blocks and rubbish, being separated by a narrow fissure, in nearly an horizontal direction from the general strata of the rock. Dr. Buckland, in his work, does not mention the elephant

* ["Guide to the Plymouth Breakwater: being a concise History of the Rise and Progress of that Great National Work, Derived from the most accurate Information and authentic Sources. By J. Claringbull, Son of the late Government Surveyor of the Breakwater." Devonport. 1840.]

and hippopotamus, as having been found here, but teeth of both of these, and likewise fragments of the skeleton of the rhinoceros were procured in 1822.

"The greater part of the bones were embedded in a stiff clay, which adhered so firmly to them, that many were broken in the separation; some, which lay on or near the surface of the clay, had acquired a thin crust of stalagmite." [pp. 36-7.]

PROFESSOR OWEN, 1846.

[In his *History of British Fossil Mammals and Birds*,* Professor Owen has the following remarks on the remains of twelve species of cave mammals found at Oreston] :—

Ursus priscus. Goldfuss. Grizzly Bear:—"The remains of the Bear [found at Oreston in 1822] consist of—

1. Left internal incisor.
2. Left upper canine, much worn by use.
3. Left lower canine.
4. Right lower canine.
5. Penultimate molar of the right side of the upper jaw.
6. Penultimate molar of the left side of the lower jaw.

The first three specimens correspond in size and form with the teeth of the great *Ursus spelæus*. The canine No. 4, though completely formed and showing marks of service, is smaller, and agrees in size with that of the *Ursus priscus*. This might possibly be a sexual difference. But the penultimate molars, which, by their much abraded tuberculate surfaces, indicate an aged individual, are not only smaller than the corresponding teeth in the *Ursus spelæus*, but have a shorter and broader crown and smaller fangs, agreeing in these characters with the *Ursus priscus*. Thus the caverns at Oreston, like those at Torquay and Gailenreuth, testify to the existence of two species of Bear, both apparently exterminated anterior to the historical period." [pp. 84-5.]

Ursus spelæus. Blumenbach. Great Cave Bear:—"At Oreston, on the coast of Devonshire, several caverns or cavernous fissures were discovered during the quarrying of the limestone for the construction of the Breakwater at Plymouth. The fossils referable to the Bear here

*["A History of British Fossil Mammals and Birds."† By Richard Owen, F.R.S., F.G.S., etc., etc., MDCCCXLVI.]

†[In the "History," the author has incorporated all that he said on the Oreston fossils in his "Report on the British Fossil Mammalia," Reports Brit. Assoc. Part i., 1842, pp. 54-74; Part ii., 1843, pp. 208-241.]

discovered [in 1822], include a canine tooth, left side, lower jaw ; a canine tooth, left side, upper jaw ; the penultimate grinder, right side, upper jaw ; the penultimate grinder, left side, lower jaw ; a portion of the sacrum ; portions of two tibiæ ; a portion of the ulna ; a portion of the femur.

Those specimens, which from their smaller size and modification of form, are referable to the *Ursus priscus*, have been already described ; the remainder agree in size with the large *Ursus spelæus*, and I have been gratified in confirming, by a close examination of these specimens, the accuracy of the opinion which Cuvier, on analogical grounds, entertained of their nature." [pp. 102-3.]

Putorius ermineus. Owen. Stoat :—" Evidence of the antiquity of the Weasel is adduced by Dr. Buckland, on the authority of Mr. Clift, from marks of nibbling by the incisor and canine teeth of a small quadruped, of the size of a Weasel, on the ulna of a Wolf and the tibia of a Horse, found fossil in one of the caves at Oreston. The account which Mr. Bell has given, in his History of the existing Quadrupeds of Britain, of the food and habits of the Weasel, is, however, scarcely reconcilable with the idea of its applying its slender acuminate teeth to the act of gnawing bones, and we shall be justified, therefore, in requiring further evidence before admitting the *Putorius vulgaris* into the catalogue of British Fossils, as the associate of the extinct Mammalia of the Oreston Caves."* [p. 118.]

Canis lupus, Owen. Wolf :—" Of the fossils from the Oreston Caverns, which I have personally examined, the following are referable to a Wolf or large species of *Canis*—

The left side of the lower jaw, with the entire series of teeth.

Four less entire rami of the lower jaw, with various proportions of the dental series : one of them is from a young, but nearly full grown animal, and is remarkable for the evidence of disease, probably the consequence of injury inflicted by the bite of a stronger animal : the jaw is enlarged by exostosis and ulcerated near the angle, which is perforated by the ulceration consequent upon an abscess, or sinus, which has eaten through the bone.

" Besides the jaws there were collected detached specimens of nearly all the teeth of both upper and lower jaws ; three fractured cervical vertebrae ; one fractured dorsal vertebra ;

* [See Mr. Cottle's description, pp. 267 and 273, above.]

one fractured lumbar vertebra; two shafts of right humeri; a left humerus, wanting the head, or upper end; portions of three ulnae, one of which exhibits the marks of having been gnawed by a small quadruped; . . . a portion of the right radius; two metacarpal bones; a phalanx of the fourth toe of the right fore-foot; the left femur; the lower end of the left tibia; three metatarsal bones; the proximal phalanx of the second toe of the left hind foot.

"All the specimens are absorbent and stick to the tongue, from the loss of their original animal matter. They were found so firmly imbedded in stiff clay, that many were broken by the workmen in separating them from it."

[Having quoted a portion of Dr. Buckland's description of the cavern already given (pp. 261-2, above), Professor Owen thus proceeds] :—

"In respect to all the fossils referable to the genus *Canis*, which were submitted to Mr. Clift's inspection, the closest and most careful comparison demonstrated a perfect agreement of the jaw-bones, in size, in form, and in the arrangement of the teeth with those of a full-grown recent wolf. . . . Nevertheless, the experience of comparative anatomists teaches that the teeth and bones of the existing Wolf, are not distinguishable from those of the larger varieties of the Dog, and my own observations have uniformly led me to the same conclusion." [pp. 125-9.]

Vulpes vulgaris, Brisson. Common Fox :—"Mr. Whidbey obtained from the . . . Orestou cavern . . . several fossil remains of the Fox, of which I have identified the following:—

Two canine teeth of the lower jaw.

A cervical vertebra.

A dorsal vertebra.

The shaft of a humerus.

A portion of the shaft of a femur.

"The two latter fossils are relatively more slender than in the Jackall. Some of the above remains are noticed by Mr. Clift, in his Paper in the Philosophical Transactions, before quoted, and all are, as he describes, equally fragile and absorbent with those of the other animals.

"Although, from the habits of concealment of the Fox, its bones might be expected to be found in caves and cavernous fissures more commonly than those of the Dog or Wolf, yet the testimony of Mr. Whidbey is adverse to the hypothesis of the recent introduction of the above-mentioned fossils into the Oreston caverns." [p. 136.]

Hyæna spelæa, Goldfuss. Cave Hyæna :—“The cavernous fissures of the limestone quarries at Oreston yielded several specimens of the *Hyæna spelæa*, among which Mr. Clift distinguished at least five or six individuals of various ages; some of them equaling the largest of those found at Kirkdale in 1820. The posterior part of a skull appeared to Mr. Clift of uncommon magnitude, measuring twice as much from every determinate point to another, as a recent full-grown Hyæna's skull.”

“This specimen has accordingly been referred by some Palæontologists to the *Hyæna spelæa major* of Goldfuss, which M. de Blainville regards with much reason as a variety of the common extinct spelæan species; merely adding, in reference to the Oreston specimen, a remark which calls for more precise dimensions of the specimens compared. The only recent skull with which Mr. Clift could compare the Oreston fossil in 1822, belonged to a small individual of the striped species (*Hyæna vulgaris*), there being no cranium of the *Hyæna crocuta* in the Hunterian Museum at that period. The following are the dimensions of the Oreston fossil, compared with the skull of the Spotted Hyæna.

	<i>Hyæna</i> In.	<i>spelæo.</i> Lines.	<i>Hyæna</i> In.	<i>crocuta.</i> Lines.
From the summit of the occipital crest to the posterior border of the glenoid cavity	6	0	4	10
To the upper border of the foramen magnum.....	3	4	2	10
Greatest breadth of occiput	5	0	3	10

“From these dimensions it will be seen, that the largest of the Hyænas from Oreston did not surpass in size the existing Spotted Hyæna of the Cape, more than did the individuals of the extinct species that have been discovered at Kirkdale and Lawford.

“In the portion of the cranium from Oreston, the convolutions of the brain have left deep impressions upon the inner surface, and the bony tentorium which divided the cerebrum from the cerebellum is well shewn; the air-sinuses are seen to have extended from the frontal to the occipital region beneath the sagittal crest.

“The Oreston cranium differs from that of the *Hyæna crocuta*, not only in its superior size, but in the absolutely smaller interspace between the occipital condyle and the occipito-mastoid process, and in the relatively greater extent of the posterior plate of the glenoid cavity.

"Another fragment of a skull from the same locality indicates a younger *Hyæna spelæa*, by the smaller size of the sagittal and occipital crests, and the limited extent of the frontal sinuses, which are not continued backwards beyond the frontal bones.

"A left ramus of the lower jaw of the *Hyæna spelæa* from Oreston corresponding in size with the larger fragment of the skull, differs from the *Hyæna crocuta* in the greater relative breadth of the posterior ridge of the second premolar tooth." [pp. 152-5.]

Felis spelæa, Goldfuss. Great Cave Tiger [Lion]:—"Two canine teeth of the *Felis spelæa* were obtained from the cavernous fissures at Oreston: one of these belonging to the upper jaw measures three inches and three quarters in length, they present the two characteristic longitudinal indentations upon the crown: . . . they may have belonged to a small female of the spelæan Tiger." [p. 165.]

Rhinoceros tichorhinus. Cuvier. Tichorhine two-horned Rhinoceros. "In 1816 a considerable portion of the skeleton of a *Rhinoceros* was discovered by Mr. Whidbey . . . in one of the cavernous fissures of the limestone quarries at Oreston, near Plymouth: the following parts, most of which were determined by Mr. Clift, were recovered and preserved:—

Two molar teeth of the upper jaw.

Four do. do. lower jaw.

Portion of the first vertebra, atlas.

Portions of four dorsal vertebrae.

Portions of two caudal vertebrae.

Portions of four ribs.

The symphysial end of an os pubis.

Portions of the right and left scapulae.

Both articular extremities of the left humerus.

Do. do. right ulna.

Do. do. left radius.

The right os unciforme.

The middle metacarpal bone of the right fore-foot.

A phalanx of the same toe.

Both articular extremities of the right femur.

Part of both extremities of the left femur.

The left patella.

A fragment of the left tibia.

Two portions of metatarsal bones of the right hind-foot.

"The size and form of the teeth, and the thick and strong

proportions of the remains of the bones of the extremities indicate them to have belonged to an animal of the same species as that still more entire specimen discovered in the Derbyshire cavern.*

"The state of the epiphyses of the long bones proves that the animal had not quite reached maturity; but in the same cavernous fissure, at Oreston, there was found part of the right humerus of an older individual of the *Rhinoceros tichorhinus*.

"The broken bones have suffered from clean fractures; none of them are gnawed or waterworn.

"In similar and adjoining caverns detached bones and teeth of the same extinct species of *Rhinoceros* were found; they were associated in one of the fissures with remains of a large species of Deer, and of the *Ursus spelaeus*; in another with fossil bones of *Equus*, *Bos*, *Cervus*, *Ursus*, *Canis*, *Hyæna*, and *Felis spelæa*. None of the bones exhibit marks of having been gnawed or broken by the teeth of the great cave-hunting Carnivora; but both these and the herbivorous species appear to have perished by accidentally falling into the cavernous fissures before they were filled up by the mud, clay, and drift." [pp. 343-5.]

Equus fossilis V. Meyer. Fossil Horse:—"It has been observed . . . by Mr. Clift in the cavernous fissures at Oreston."† [p. 383.]

Equus plicideus. Owen. Fossil Horse, with the enamel-folds of the Molar Teeth plicated:—"Amongst the numerous teeth of a species of *Equus*, as large as a horse fourteen hands and a half high, collected from the Oreston cavernous fissures, I have found specimens clearly indicating two distinct species, so far as specific differences may be founded on well-marked modifications of the teeth.

"One of these, like the ordinary *Equus fossilis* of the drift and pleistocene formations, differs from the existing *Equus caballus* by the minor transverse diameter of the molar teeth; the other, in a more complex and elegant plication of the enamel, and in the bilobed posterior termination of the grinding surface of the last upper molar, more closely approximates to the extinct Horse of the miocene

* [The author here refers to the discovery of nearly the whole skeleton of *Rhinoceros tichorhinus* in the Dream Cave at Wirksworth, Derbyshire. See *Foss. Mam.*, &c. p. 332, &c.]

† [The author's Fig. 145, p. 387, is that of 3rd. lower molar, *Equus fossilis*, Oreston.]

period, which M. H. v. Meyer has characterized under the name of the *Equus caballus primigenius*. The Oreston remains differ, however, from this in the form of the fifth or internal prism of dentine in the upper molars, and in its continuation with the anterior lobe of the tooth; the fifth prism being oval and insulated in the *Equus primigenius* of v. Meyer.

"The Oreston fossil teeth, which in their principal characters manifest so close a relationship with the miocene *Equus primigenius*, differ, like the later drift species (*Eq. fossilis*), from the recent Horse in a greater proportional antero-posterior diameter of the crown of the second upper molar, and also in a less produced anterior angle of the first molar. . . .

[Speaking of his *Fig. 154*, p. 394, the author says], "I figure here the fossil right lower canine of a colt, found in the same cavernous fissure as the plicident molars, and probably therefore, belonging to the same species: the view of the inner side shows the folding in of the anterior and posterior margins of the crown, characteristic of the canines of the genus *Equus*. The incisors associated with the plicident molars offers no distinctive characters.

"Some of the bones of the extremities of the fossil Horse from the same fissure of the Oreston Caves, indicate an animal about thirteen hands and a half high. The astragalus is a very characteristic bone of the present genus; the upper articular surface is oblique, and the two convex ridges are divided by an unusually deep, almost angular, valley; the articular pulley or trochlea, in the lower end of the tibia has, of course, a corresponding form—the cavities and eminences being reversed; by the depth and obliquity of these, the tibia and astragalus of the Horse may readily be distinguished from those bones in any other quadruped of similar size. The last phalanx, or hoof-bone, is an equally characteristic bone.

"The contemporary species associated with the *Equus fossilis* in the Oreston Caverns, but indicated to be distinct by the structure of the molar teeth above described, I have called, in my 'Report on British Fossil Mammalia,'* *Equus plicidens*, on account of the characteristic plication of the enamel." [pp. 392-5.]

[The author's section on "*Equus plicidens*" is illustrated with five figures of fossils from Oreston, viz. "1st upper molar; 2nd molar, upper jaw; lower canine tooth"—all of *E. plicidens*;—and "Astragalus of fossil Horse," and "Hoof-phalanx of fossil Horse."]

* 'Trans. Brit. Association,' 1843, p. 231.

Asinus fossilis, Owen. Fossil Ass, or Zebra :—In the more recent or diluvial formations a fossil species of *Equus*, about the size of the Wild Ass, is indicated by molar teeth. Of these I have examined a middle molar of the left side of the upper jaw, from the drift overlying the London clay at Chatham; a corresponding molar from the opposite side of the upper jaw, from the drift at Kessingland in Suffolk; the last upper molar, from the same deposit and locality; and a fifth molar, left side of lower jaw, from a cavernous fissure at Oreston: all these teeth were in the same fossilized condition as the associated remains of extinct Mammals with which they had clearly been contemporaneous." [p. 396.]

[The author has two Figures—157 and 158, p. 396,—labelled respectively, "Upper molar, *Asinus fossilis*, Oreston," and "Last upper molar, *Asinus fossilis*, Oreston;" but which are stated in the text to be from Kessingland in Suffolk.]

Bison minor. Owen. [In his section on *Bison priscus*, Owen, Great fossil Aurochs, the author speaks of] "two metatarsals of a smaller species or variety of Bison, from the cavernous fissures at Oreston" [p. 497], [and his Fig. 206, on the same page is labelled] "Metatarsal, *Bison minor*, Oreston."

Bos longifrons, Owen. Long-fronted, or small fossil Ox :— "Mature Bovine metacarpal and metatarsal bones, shorter than those of an ordinary domestic Ox, or not exceeding them in size, but thicker in proportion to their length, have been found fossil in the caves at Kirkdale and Oreston. I suspect these to belong to the *Bos longifrons*; at all events they testify the co-existence of an ordinary-sized *Bos* with the extinct *Carnivora* of that remote period, and one, therefore, more likely to become their prey, than the comparatively gigantic *Bison* and *Urus*." [p. 513.]

[From the foregoing gleanings it appears that Professor Owen has recognized twelve species of Oreston cave mammals. In the following Table these are arranged so as to show at one glance their scientific and common names, &c.

Scientific Name.	Common Name.	Extinct.	Recent.	Figures.
1 <i>Ursus priscus</i>	Ancient bear	+	.	.
2 <i>U. spelæus</i>	Cave bear	+	.	.
3 <i>Canis lupus</i>	Wolf	.	+	4
4 <i>Vulpes vulgaris</i>	Fox	.	+	1
5 <i>Hyæna spelæa</i>	Cave hyæna	+	.	
6 <i>Felis spelæa</i>	Cave lion	+	.	
7 <i>Rhinoceros tichorhinus</i>	Partitioned-wall-nosed rhinoceros	+	.	
8 <i>Equus fossilis</i>	Fossil horse	+	.	1
9 <i>E. plicidens</i>	Plicated-tooth horse	+	.	5
10 <i>Asinus fossilis</i>	Fossil ass or zebra	+	.	2
11 <i>Bison minor</i>	Lesser bison	+	.	1
12 <i>Bos longifrons</i>	Long-fronted ox	+	.	
		10	2	14

On comparing this Table with the similar one for Kent's Cavern, compiled from the same work,* the following facts present themselves. 1st. The Oreston list contains *Equus plicidens*, *Asinus fossilis*, *Bison minor*, and *Bos longifrons*, neither of which occur in his Kent's Hole list.

2nd. The Oreston list does not contain the Great Horse-shoe bat, the Shrew, the Badger, the Stoat, the Wild cat, *Machairodus latidens*, the Water vole, the Field vole, the Bank vole, the Hare, the Rabbit, the Cave pika, the Mammoth, the Hippopotamus, the "Irish Elk," the Gigantic round-antlered deer, or the Red deer, all of which do occur in his Kent's Hole list.]

MR. PENGELLY, 1859.

[In 1859, Mr. Pengelly read to the Geological Section of the British Association, during its meeting at Aberdeen, a paper on the "Oreston Fissures." This was printed in abstract in the annual Report of that body,† and in extenso in the "Geologist."‡ The latter will be used in the present compilation. After recapitulating briefly the substance of the papers by Mr. Whidbey and others, which have been already quoted, the author proceeds thus] :—

* [See *Trans. Devon Assoc.* vol. ii. pp. 502-3. 1868.]

† [See Brit. Assoc. "Report" 1859, pp. 121-3.]

‡ ["On the Ossiferous Fissures at Oreston, near Plymouth." By W. Pengelly, F.C.S. "Geologist," 1859. pp. 434-444]

"In his letter to Mr. Barrow, dated Plymouth, November 9th, 1822, Mr. Whidbey says, 'These I think will be the last bones I shall send you from these caves, as they are now nearly worked out.' And so far as he was concerned, Mr. Whidbey was right; they *were* the last bones he sent up; but after the lapse of thirty-six years the quarrymen have found other caverns and fissures rich in bones.

"My attention was first called to the subject towards the close of 1858, by a letter from Dr. Percy, of the School of Mines, Jermyn Street, in which he mentioned that a gentleman had just brought to town some large bones recently found at Oreston, and suggested that attention should be given to the matter. About the middle of January [1859], a dealer in geological specimens, at Plymouth, wrote to inform me that a day or two before he had got possession of some fossils which he believed to be of great value. I took the earliest opportunity of visiting him, and found his fossils to be mammalian remains just exhumed from a new cavern at Oreston. They consisted of a considerable number of teeth [and bones], most of them of herbivores—including the elephant [*Elephas primigenius*]; with a few of carnivorous animals, amongst others, the cave-lion and cavern-bear."

[Having stated that he purchased the specimens just mentioned; made frequent visits to the quarries, where, in order to prevent the specimens being dispersed and thereby lost to science, he arranged with the workmen to buy all they found; and that he lodged in the British Museum all that he obtained; the author continues thus]:—"My endeavours to preserve the integrity of the series have only been partially successful. One lot has found its way to the Museum at Leeds, another . . . has been purchased for the University Museum at Oxford, by a lady, . . . a considerable number are in the possession of Mr. Hodge, of Plymouth. . . . So far, however, as these cases are concerned no harm has been done—the specimens thus disposed of would doubtless be readily available for scientific purposes; but . . . crowds of persons visited the quarries, and eagerly secured . . . what very many of them regarded as . . . incontestible proofs of the occurrence and universality of the Noachian deluge. Such specimens—and I have reason to believe they are very numerous—are probably irrecoverably lost.

"I was so fortunate as to find an old man at work in the quarries who had been connected with them all his lifetime. He had seen the foundation stone of the Breakwater torn

from the parent rock, and shipped to be transported to its new bed at the bottom of Plymouth Sound. He pointed out to me the line of direction of Mr. Whidbey's caverns, whence it appeared that the new one was in the same line, as if the various caverns had been so many enlarged portions of one and the same original line of fracture.

"The Oreston limestone consists of a series of beds varying from one foot to ten feet in thickness, dipping in a direction south fifteen degrees west, at an angle of about thirty-two degrees. The artificial cliff produced by the quarrying operation of half a century is, at present, about sixty feet high; its base is one thousand and ninety feet from the quay, or river margin, and fifteen feet above the level of high water at spring-tides; hence the new cavern was about four hundred and eighty-seven feet from Mr. Whidbey's third [or last] cavern. . . .

"This cavern was ninety feet long, and extended in a direction from north-north-east to south-south-west, or very nearly that of the dip of the limestone beds. It commenced about eight feet below the top of the cliff, and continued to its base, so that it was about fifty-two feet high; indeed, its height exceeded this, as the bottom had not been reached. At the top it was about two feet wide, gradually increasing downwards, and reaching a width of ten feet at its bottom. The first or uppermost eight feet were occupied with what the workmen called 'gravel,' which consisted of angular portions of the adjacent limestone, mixed with a comparatively small amount of sand. The limestone debris varied in dimensions from fragments of the size of hazel-nuts to pieces ten pounds in weight. This accumulation was entirely free from stalagmite, and was in no part cemented. No traces of fossils were found in it. The next thirty-two feet in depth were occupied with similar materials . . . (the sand being somewhat more abundant), with the addition of a considerable quantity of tough, dark, unctuous clay.

"Between this mass of heterogeneous materials and the western, or what may be called the river, wall of the cavern there occurred a nearly vertical brecciated plate, or dyke, which the workmen denominated 'callis,' extremely tough, and quite as difficult to work as the limestone itself. The only means of severing it was by blasting; and being considerably less compact than the limestone, the . . . powder told on it with less effect. It may be described as an approximately vertical plate of stalactitic carbonate of lime, containing at by no means very wide intervals, masses of breccia

made up of the materials just named. . . . Some of these masses measured fully a yard cube, but the general thickness of the 'callis' was about two feet. This was the bone-bed. That is to say, the bones were found alike in the 'callis,' and in the mass of heterogeneous materials beside it; in the cemented and uncemented portions of the bed. They were found alike at all heights or levels, in the lumps of breccia, in the pure stalagmite between them, and in the looser and less coherent portion of the accumulation; thereby suggesting that the cavern was slowly and gradually filled with limestone debris detached from the rock in which it occurs, with sand transported at least from some distance, and with mud; not each in definitely successive periods, but together, with occasional pauses or periods of cessation; the proof of such pauses being the frequent presence of the portions of pure stalagmite separating series of brecciated masses . . . lying one above another in the same nearly vertical plane. The rapidity of the in-filling, and, hence, the time required for the process, seem of necessity to be measured by the rate of deposition of the stalagmite, whatever that may have been. It appears, too, that throughout the entire period—be it long or short—required for, and represented by, the accumulation of the materials now under consideration—alike during the periods of active and those of tardy accumulation—bones of various animals were introduced and inhumed, and that there was no marked cessation in this part of the work, since the bones were found as frequently in the pure stalagmite as elsewhere.

"I always know," said the old quarryman before alluded to, 'when we are coming to bones where there's clay, for the clay is always fat-like. I suppose 'tis the fat of the beasts that the bones belonged to.' Evidently he was not enough [or he was too much] of a philosopher to explain phenomena by calling to his aid the 'plastic,' or the 'sportive powers of Nature,' and probably he was so benighted as never to have heard of the discovery of 'prochronism.'*

"A somewhat considerable number of clay balls, generally ellipsoidal, and varying from an inch and a half to two and a half inches in greatest diameter, were found in the clay throughout the bone-bed, but not above or below it.

"Beneath the mass of materials just described, occurred a bed of dark, very tough, unctuous clay, known to be twelve feet thick, but perhaps more, as its base had not been reached. . . . Occasionally it contained a few very small angular stones.

* See "Omphalos." By Philip Henry Gosse. 1857.

but with this exception it was perfectly homogeneous. No traces of fossils had been found in it.

"It now remains to consider how the contents of the cavern were introduced. The workmen most positively assert that it never was an open fissure; that the roof, eight feet in thickness, was of sound unbroken limestone; and that the stones and other materials could not have fallen in from above. But, then, unfortunately they as positively affirm that there was no external opening whatever—whether vertical, terminal, or lateral; and in their endeavours to account for the presence of the bones and rock-debris in what they believe to have been merely a blind cavity in the rock, they incline to the opinion that the rock had grown around the accumulation which it contains.

"The greater part of the roof was destroyed before I visited Oreston; nevertheless, . . . a sufficient portion for the purpose remained. It was evidently a mass of limestone-breccia, made up of large angular fragments cemented with carbonate of lime, and easily enough mistaken, without a careful inspection, for ordinary limestone somewhat rich in coarse veins. I called the attention of the workmen to it, and explained my opinion respecting its origin. To this they offered no objection further than that it was solid, and required blasting quite as much as the limestone elsewhere. This appears to have been Mr. Whidbey's test; for, in his first letter to Sir Joseph Banks, he says 'the rock surrounding the cavern was equally hard with the other parts, requiring the same force to blast, and that the quarrying was paid for accordingly.'*

"Whether that part of the roof which had been destroyed before my visit was unbroken rock or breccia cannot now be determined, but its removal had exposed the surface of the wall of a nearly vertical fissure throughout the entire length of the cavern, which, by its soil-stained surface, distinctly showed that water plentifully charged with mud, had had free access into the cavern from the surface; or, in other words, that at least a line of fracture had extended from the cavern upwards to the surface throughout the entire length of that portion which is not known to have had a brecciated roof. My own opinion is, that there is ample reason for believing that the cavern originally communicated with the surface by an opening sufficiently wide to allow the passage of all its contents, and that it was thus filled; but whether animals fell or were dragged in, or whether the

* [See p. 250, above.]
x 2

bones found there were wholly or partially the disjointed remnants of dead animals washed in, I will not undertake to say. I cannot but think that some of the bones appear to have been rolled, as if they had been washed in; whilst if, as Sir Henry De la Beche supposed, the loam, or clay, is really impregnated with animal matter, it seems reasonable to infer that, at least in some cases, something more than mere portions of the osseous system was introduced.

"The workmen state that from the southern extremity of the cavern, . . . a low narrow passage . . . leads into another cavern, . . . 'about the size of a room.' . . . Judging from their own account, it must be rudely a cube of about twelve feet in the side. It does not seem to contain any fossils. Ever since my acquaintance with the locality commenced, the entrance to this passage has been completely blocked up with ordinary quarry refuse.

"My object in this paper has been to endeavour to keep the subject of caverns somewhat prominently before geologists, for . . . I cannot but think it desirable to organize some scheme for the purpose of exploring and reporting on our British caves. Oreston has slipped through our fingers; the workmen have had the cave under their management, or rather mismanagement; the specimens have been badly exhumed; they have been dispersed beyond the power of science to recover them; the materials in which they were deposited have been carted away without examination; whether they contained any . . . flint knives or other . . . indications of human existence is not known, and never can be known." [pp. 439-444.]

MR. H. C. HODGE, 1859.

[A paper on the Oreston Cavern of 1858-9 was also read to the Geological Section of the British Association at Aberdeen, in 1859, by Mr. Hodge, and printed *in extenso* in the Geologist for 1860,* and in abstract in the Report of the Association for 1859. After some remarks respecting the previous caverns in the same quarries, the author says]:— "Since that period [1822-3], it would appear that similar openings in the limestone have been of not unfrequent occurrence, and it is known that some of them have contained fossils; but no systematic observations have, I believe, been

* "ON THE OSSIFEROUS CAVERNS AT ORESTON. By Henry C. Hodge, of Plymouth. Read before the Geological Section, Sept. 17, 1859." *Geologist*, 1860, pp. 26-30, 343-7, 377-9.

instituted with the view of penetrating their origin or history.

"The statements so confidently made by Mr. Whidbey as to the perfect enclosure of the caverns by solid limestone, have been confirmed by my own observations, and this fact has not failed to surprise even the workmen engaged in the quarry; but it must be evident that at some period an opening did exist, and it occurred to me that such might be most successfully sought for between the surfaces of the beds of which the masses of limestone are composed. No satisfactory conclusion could be drawn from a careful examination of the rock during the opening of the cavern; but, on looking narrowly at the beds of limestone in the progress of the workings, it was found that a thin seam of purple calcareous 'slate' was interposed between the beds of limestone, at *about* the same parallel as that in which the caverns were met with. On further investigation, it was discovered that alternations of this purple 'slate' with the limestone were not unfrequent, but the laminæ of slate were, in most cases, so intimately blended with the limestone-beds, as to form really a solid mass of compact rock; and on looking into the structure of the more evident layers of the 'slate,' it was ascertained that in some parts they were much more calcareous than in others, and that small portions of limestone, having similar physical characters to those of the surrounding rock, were interspersed at varying intervals. In other places the layers were in a state of decomposition, red and reddish white clay being formed as its result; and on tracing a layer of this kind through the side of a cavern laid open during the workings, it was seen that portions of it were so disintegrated as to be easily pulled from their position, the seam being, in its most solid portions, composed merely of layers of limestone-fragments with interposed clay and red sand—the whole, apparently, kept in place by the accidental infiltration of calcareous matter. Here, then, were facts that might enable me to account for the clay found in the caverns, and afford a means through which the beds of limestone may have been caused to separate from each other. Again, it was discovered that some of the hollows in the adjoining limestone were stained with a black earthy substance, found, on analysis, to be composed of the peroxides of iron and manganese, these having evidently proceeded from the decomposition of a variety of dolomite very generally present in this limestone—not exhibiting, however, any definite mode of deposit in it, but passing through its beds in the most irregular manner.

From these phenomena, it appeared reasonable to conclude that the decomposition of the 'slate' in the layers, through the combined agency of water and carbonic acid, had opened a communication with the external air to the above-named irregular masses of dolomite (the unchanged limestone-fragments of the 'slate' serving to keep the beds from close contact with each other), and that in this way the carbonates of iron and manganese contained in them had been converted into peroxides, and the evolved carbonic acid proceeding from their decomposition, combining with the remaining constituents of the dolomite, had formed bicarbonates, readily removable by the agency of percolating water. In this way it is possible, not merely to account for the formation of the caverns, and a means of access to them, but at the same time to discover what are the causes still in operation which give rise to the production of stalactite, and occasion the irregular dolomization of the limestone, it being evident that the percolating waters, charged with bicarbonates of lime, magnesia, &c., may, by a loss of carbonic acid, deposit insoluble carbonate of lime in the form of stalactite, and becoming by this means richer in bicarbonate of magnesia, act chemically on the neighbouring limestone, converting it into dolomite.

To test the correctness of these views, a very careful examination of the clay below the bones was instituted: it was extremely tenacious, and of a dark reddish-brown colour; patches of red clay were visible in some places, and in other parts of the mass distinct yellow and black layers were apparent, and nodules, or, more strictly speaking, irregular masses of impure ochry red iron-ore, together with black, rounded fragments, evidently arising from the decomposition of a dolomite similar to that before alluded to—for in the larger fragments this rock was distinctly visible on fracture, and in one or two instances, in which the masses were larger than usual, a brown zone was observable between the black external coating and the central nearly unaltered dolomite; large and small masses of the common limestone-rock of the quarry were also found in the clay, their surfaces being honey-combed as if by exposure to the long-continued action of carbonated waters. These phenomena may justly be explained on the supposition, that the irregular masses of ochry iron-ore had been derived from the decomposition of slaty seams, confirmatory appearances being not unfrequent in other limestone-beds connected with the same series of rocks, the 'slate' in these alternating with the limestone on a large scale, and containing irregular nodules of impure iron-

ore—a red oxide of iron being frequently visible at the points of junction. The varied colour of the clay may also be accounted for by the gradual admixture with it of the red oxide of iron from the slaty seams, and the black oxide of manganese, accompanied by yellow hydrated peroxide of iron from the dolomitic rock, which may be concluded to have formed a part of the walls of the cavern—the honey-combed limestone fragments resulting from the displacement of other portions of previously fissured limestone-rock through the agency of aqueous carbonic acid. The most careful examination presented no facts that at all appeared of an opposing character; the clay was diligently searched, and some of its laminated portions, having a sandy appearance, were examined by the microscope for the siliceous coverings of infusoria, minute rounded grains of sand, and any other matter that might suggest the washing in of the contents of the cavern through free communication of its opening with external waters; nothing was, however, discovered but very minute fragments of slate, still further confirmatory of the position before advanced.

"The facts elicited were thus far satisfactory, but they did not account for the original production of those masses of dolomite, which in the neighbourhood of the quarry, alone afforded, by their own decomposition, the solution of bicarbonates required for the dolomitization of adjacent rocks; and in the hope that a knowledge of such original cause might throw still further light upon the present constitution of the bone-caves, a general examination of the various accessible quarries of the Plymouth limestones was instituted.

"I am disposed to believe that very little stalactite was deposited in the bone-caves during the early period of their formation, and a portion, if not the whole, of the time during which the bones were being introduced. My reasons, confirmed by the observations of Mr. Whidbey, before alluded to, are the following:—The bones have been generally found lying on or near the uppermost portions of a bed of clay, and those on its upper surface only are much mixed with, or imbedded in stalagmite, the remains met with lowest in the clay being especially free from such deposit. It is reasonable also to suppose that, if the fossil bones were introduced through the agency of carnivorous cave-inhabiting mammalia, the instincts of these creatures would have induced them to prefer a dry habitation, and one in which the constant dropping of percolating waters would give them no incon-

venience, not to mention the constant disengagement of carbonic acid accompanying the deposition of the stalactite, which might even, under some circumstances, render such caverns uninhabitable.

"In giving an opinion that the bones were introduced by animal agency, and not by accidental falling into fissures, it is not to be inferred that, in no former recorded instance, has this mode of entombment occurred. I will, however, give some facts connected with the nature and mode of occurrence of these remains, before attempting to deduce any further conclusions in the present instance.

"In the first, I would mention that remains of very large animals were met with, the occurrence of portions of several mammoths being proved by the presence of various grinders belonging not merely to very young, but also to somewhat mature animals, a fourth molar of the lower jaw of an animal of this species having been found six and a quarter inches in length, the breadth at its widest part being two and a quarter inches, containing sixteen plates, which have all been brought into use, the tooth being worn down at its anterior extremity, so as to exhibit the common uniting base of dentine along the margins of the first and second plates. A second corresponding molar of the lower jaw wanting a few plates at its anterior portion, together with fragments of two other fourth molars in different stages of development were also met with, and teeth of larger size than these were indicated by the presence in the clay of other detached and fractured plates. I would also add that there occurred a few fractured portions of one or more molar teeth of the rhinoceros, but no mammoth's or other large bones were discovered.

"The above facts being considered, can we allow that such ponderous animals could have fallen upon a soft tenacious bed of clay without sinking more than a few inches into it? or that their skeletons could have been washed down from above, without a much greater disturbance of the clay than was found to be indicated by the parallel and undisturbed arrangement of its laminated portions? Could, moreover, these monsters have fallen into the cavern, without a much greater apparent disturbance of the beds of limestone having been caused by the formation of a sufficiently large opening; and would not, in such cases, numerous other parts of the skeleton have been met with?

"Secondly, numerous teeth of elk or deer and of ox were found, but no antlers nor horn-cores belonging to such animals (a single fragment of the base of an antler and one small

horn-core excepted), which would, most probably, have been the case, had the fissure been a large one, and some fragments, at least, of the fragile antlers might naturally have been expected to occur, had such been washed down from a higher level ; on the other hand, it may be presumed that they would have proved to carnivora an inconvenient and unprofitable burthen for carriage into their den.

" Thirdly, among the bones met with, scarcely a single large one had escaped fracture, with the exception of the astragalus and other hard and solid bones of the tarsus and carpus joints and those of the feet ; facts perfectly similar to those observed by Dr. Buckland in the hyæna cave at Kirkdale, in which the presence of their numerous coprolites proved that these animals inhabited the cavern.

" Fourthly, although the cave did not contain any remains of hyænas or their coprolites,* several teeth of bear and lions or tigers were discovered ; and I think it may be legitimately deduced from the occurrence of these cave-inhabiting animals that the bones above referred to had been fractured by them for the purpose of obtaining their edible contents ; the occurrence of several fragments of canines of the gigantic *Felis spelæa* having the two characteristic longitudinal indentations on their crowns, together with the canine and sectorial molar of an immense lion or tiger, the former tooth measuring five and three quarter inches in length, may too, I imagine, satisfactorily account for the strength required to carry the remains of such animals as the mammoth and rhinoceros into the cave.

" Lastly, I would remark that the view of the non-accidental introduction of the remains into the cave appeared still further to be confirmed by the appearances presented in a fissure unexpectedly opened into by the workmen, and separated from the larger cavern by a comparatively thin wall of solid limestone. Here many of the bones were only slightly fractured, and there occurred the nearly perfect skull of a hog,† encrusted with stalactite, a cast in the same substance of the interior of the cranium of another animal, together with remains, apparently belonging to the bear, wolf, or large dog, and the horse, with various other fractured bones cemented into a breccia-like mass by a mixture of clay and stalactite. These appearances coincide with what might have been expected to have occurred in the case of bones that had accidentally fallen into a fissure, and it is not unlikely

* [See Mr. Cottle's description, p. 273. Table, above.]

† [This specimen is in my collection. W. P.]

that they may have been rolled into it through a small deep hole communicating with the large cavern, but not sufficiently capacious to allow of entrance for the recovery of the carcass. The brecciated bones in the clayey stalactite, might have been also derived from the larger cave by the constant falling into it of fragments of bone rejected by the carnivora, and which, as might be expected from lying for some time in their den, would be well mixed with the clay that formed its bottom.

"A few of the bones were traversed in all directions by fissures filled with clayey stalagnite, a mass composed of broken plates of a tooth of the mammoth being in this condition—these facts possibly indicating displacement of the walls of the cave after the introduction of the bones, such dislocation affording the opening, by means of which the superficial stalagmite was introduced.

"In concluding this part of my description of the caverns and their inhabitants, I will enumerate the genera of animals to which the specimens (nearly all of which are in my own possession) belong.

"To the thick-skinned quadrupeds belong animals of at least four genera—Elephant, Rhinoceros, Horse, and Hog.

"In addition to the large grinders of the mammoth, before described, there occurred a remarkable molar of a very young mammoth (length or antero-posterior diameter of the crown one inch and three quarters, breadth one inch and one eighth), containing six plates; it appears to belong to the thick-plated variety, but is unlike any of the numerous small grinders of this animal, contained in the British Museum and elsewhere, with which it has been carefully compared.

"The larger molars of the rhinoceros were all fragmentary; but a small tooth, having its enamel equally thick with that of the larger specimens, may, it is presumed, belong to a small species of that animal.

"The teeth of the horse were comparatively very numerous, and comprised the two species, *Equus fossilis* and *E. plicidens*. Some of the molars were remarkable, not merely with reference to their large size, but also on account of the elegant plications of their enamel folds, the festoons being more complex than usual, and in one of these the presence of a small additional and nearly oval island is apparent. Whether this specimen belonged to the ancient primigenial Hippotherium I am as yet unable to determine. There were also various specimens of astragalus, a large coronary bone, and portions of jaw with teeth. Other remains included teeth referable to those of a fossil ass or zebra.

"The chief remains of the hog were the interesting skull before alluded to ; it, however, wanted that portion containing the incisors, tusks, and pre-molar teeth. An interesting fragment, containing three pre-molars *in situ*, and still retaining the base of a tusk of the lower jaw, together with a considerable portion of the extremity of a tusk of the upper jaw was afterwards met with in the stalagmite. Another portion of the jaw of a young hog, its last molar tooth not having yet cut the gum, was found, together with various large molars, pre-molars, incisors, and two tolerably perfect tusks, belonging respectively to the upper and lower jaw of this animal. It was remarked that some of the teeth were in both caverns singularly stained of a yellow colour.

"The remnants probably include one or two species of elk or deer, and two or three animals allied to the ox. Teeth of the sheep or goat were also brought me from the clay, but I have reason to be doubtful about the genuineness of many of the last-named specimens.

"Among the remains of animals of the deer tribe, I would specially mention an interesting fragment of jaw, containing several teeth, developed by me with some pains from a large and nearly solid mass of stalagmitic matter, containing various other imbedded bones. There occurred, too, a very few fractured specimens of teeth, suggestive of those of a giraffe (this possibility having been ascertained by comparison with figures of fossil teeth contained in a paper by Dr. Falconer and Capt. Cautley, in the Proceedings of the Geological Society of London) and a small horn core may, it is presumed, also indicate the presence of an animal allied to a species of this interesting quadruped.*

"Among the bones of large oxen were teeth, some characteristic fragments of the metacarpal and metatarsal bones, and also two or three specimens of astragalus.

"Of the carnivorous animals, canines and molar teeth of the bear predominated, indicating the existence of two or more

* "Since the above has been written, I have had an opportunity of comparing these fragments with teeth of similar form, from the Sewalik hills in the north of India, contained in the Museum of Marischal College, Aberdeen; and I am indebted to the kindness of Professor Owen for further confirmation of the opinion that the teeth are really those of a species of a fossil giraffe. The Museum at Aberdeen contains numerous other fossils and casts of jaws with teeth, from the same locality. From an inspection of them, I feel also justified in concluding that two other pre-molars found at Oreston belong to a species of fossil camel. These facts will, if fully confirmed, place on record the (I believe) first instance of remains of these interesting genera having been found in Britain, and also tend to indicate their extensive geographical range during the geological period under consideration."

species, among which may doubtless be included *Ursus spelaeus* and *U. priscus*.

"The interesting though fragmentary canines of the cave lion or tiger, and of the still larger and probably undescribed species before referred to, were for the most part met with very near to the large grinders of the mammoth before described. Among the specimens referred to the wolf or large dog were many of different magnitude, and I suspect that there may be good evidence of the existence of carnivora intermediate in size between that of the wolf and the larger feline animals.

"Of the gnawing animals there were evident traces of small incisor teeth of a quadruped about the size of a mouse diffused through some of the upper parts of the clay, and one tolerably perfect ramus of a jaw was found loosely attached to the side of a small cavity laid open on breaking a large mass of stalagmite.

"There also occurred a very few hollow conical teeth of two kinds, some of which are possibly those of very immense reptiles, a cast in the stalagmite of the abdominal rings and elytra of a supposed coleopterous insect, some bones of birds, and, indeed, many other specimens, some of which may still be included in masses of clayey stalagmitic matter that I have not yet had time to examine.

"I have been informed by the manager of the quarry that a great number of bones and teeth were discovered before my arrival in Plymouth, and that most of these were sold to the bone merchant. Many also of the remains have been unavoidably dispersed in various other directions during my conduct of these investigations." [pp. 26-30, and 343-4.]

[The remainder of Mr. Hodge's paper was occupied with matter of a speculative character, having no special reference to the Oreston or other caverns.]

DR. FALCONER, 1859.

[The late Dr. Hugh Falconer came "to the conclusion that there were four distinct Pliocene and Post-Pliocene species of Rhinoceros, three of which had long been confounded by Cuvier and other palaeontologists under the name of *Rhinoceros leptorhinus*." "The four species," he says, "may be classified as follows:—

PLIOCENE.

I. *No bony nasal septum.*

- 1 *Rhinoceros leptorhinus.* (Cuv. *pro parte.*)
Syn. *R. megarhinus* of Christol.

II. *Partial bony septum.*

2 Rhinoceros Etruscus. (Falc.)

Syn. *R. leptorhinus*. (Cuv. *pro parte*.)

3 Rhinoceros hemitoechus. (Falc.)

Syn. *R. leptorhinus*. (Owen *pro parte*.)

POST-PLIOCENE.

III. *Complete bony septum.*

4 Rhinoceros antiquitatis. (Blumb.)

Syn. *R. tichorhinus*. (Fischer and Cuvier.)*

His Palæontological Memoirs contain the following brief note on the Oreston fossils] :—

“ NOTE ON RHINOCEROS HEMTICECHUS FROM ORESTON.

College of Surgeons, 10th August, 1859.

“ To-day compared the Rhinoceros teeth from Oreston, described by Whidbey in the ‘Phil. Trans.’ for 1817–21, and –23, and referred to by Owen in Brit. Fos. Mam. as belonging to *R. tichorhinus*. There are only three upper molars, Nos. 877, 878, and 879. The first is the right upper antepenultimate, and the second the left do. of probably the same individual. Both are broken, but conversely, *i.e.* the anterior end of 877 and the posterior of 878, so that jointly they give the complete form of one tooth. They agree in both showing the crochet of the posterior barrel, as in Cuvier’s drawing. They are quite unlike *R. tichorhinus*, and I believe that they agree with *R. hemitoechus*. ” †

MESSRS. BOYD DAWKINS AND AYSHFORD SANFORD, 1866.

[The following brief notices of Oreston occur in “The British Pleistocene Mammalia,† Part i., by Messrs. Boyd Dawkins and Ayshford Sauford.]

“ Professor Owen considers that the solidungulate remains indicate the coexistence of three distinct species [of *Equus*] in Pleistocene Britain ;—*Equus fossilis*, a species distinct from the living *E. caballus*, *Equus plicidens*, based on molar teeth from Oreston, and *Asinus fossilis* from Chatham, Oreston, Thorpe, and Kessingland. These last two may turn out to

* [See “Palæontological Memoirs and Notes of the late Hugh Falconer, M.A., M.D., compiled and edited by Charles Murchison, M.D., F.R.S., 1863,” vol. ii. p. 309.]

† Op. cit. vol. ii. pp. 353–4.

‡ [“The British Pleistocene Mammalia. By W. Boyd Dawkins, M.A., F.G.S., and W. Ayshford Sanford, F.G.S. 1866.” One of the Monographs of the Palæotographical Society. Part i.]

be varieties of *Equus fossilis*, and that species we can determine by no special mark except by the smaller transverse measurement of the teeth, from the living *Equus caballus*. It is possible that the smaller remains ascribed to *Asinus fossilis* may have belonged to the ass, but at least it is equally possible that they may have belonged to a small variety of horse." ["Introduction," p. xxix.]

"We have good specimens [of phalanges of *Felis spelaea*] from Sandford Hill, Oreston, Caldy, and other places." [p. 26.]

"They [phalanges of *Felis spelaea*] occur also from the Sandford Hill Cave, and from Oreston, Caldy, Ilford, and a great many other localities." [p. 27.]

MR. BUSK, 1870.

[Mr. Busk made the Rhinoceros remains found at Oreston the subject of the following paper, read to the Geological Society of London, 27th April, 1870* :—]

"In the year 1816, during the course of the quarrying of the limestone-rock at Oreston for the construction of the Plymouth Breakwater, a cavernous fissure was opened, containing numerous more or less fragmentary remains of *Rhinoceros*, but none of any other animal.

"Notice of this discovery was given by Mr. Whidbey, the engineer of the works, to Sir Joseph Banks, at whose instance the bones were submitted to Sir Everard Home for examination, by whom a short paper on the subject was communicated to the Royal Society, which was published in the 'Philosophical Transactions' for 1817.

"This paper contains little more than a mere enumeration of bones and teeth, which are all assigned to *Rhinoceros*; and it was considered probable by Sir Everard Home that they belonged to three individuals.

"In 1821 several other cavities in the limestone, of the same kind, were encountered, in one of which, amongst other mammalian remains, chiefly of Bear, a single tooth of *Rhinoceros* was met with, 'lying apart from the rest'; this is described by Sir E. Home as the 'fourth grinder from the front, right side, of the Single-horned Rhinoceros.'

"The above appear to have been the only Rhinocerine remains discovered at Oreston; for, although in 1823 a further set of caverns was laid open, whose contents have been ably

* ["On the Species of *Rhinoceros* whose Remains were found in a Fissure-Cavern at Oreston in 1816. By George Busk, F.B.S., F.G.S." Quart. Journ. Geol. Soc., vol. xxvi., pp. 457-468. 1870.]

described by Mr. Clift in the 'Philosophical Transactions' for 1824, nothing belonging to Rhinoceros was there found.*

"The specimens enumerated by Sir E. Home are about twenty-two in number; but this cannot have included all that were sent by Mr. Whidbey, since the number of specimens assigned to the locality in the Catalogue of the Museum of the Royal College of Surgeons, where they are deposited, is thirty-eight or thirty-nine. They are numbered from 877 to 916. The tooth mentioned by Sir E. Home as having been found in the second cavern does not appear to be among them; and one of the numbered specimens is not at present forthcoming.

"As regards condition and colour, with one or two exceptions, the specimens have a very uniform aspect; and it is highly probable that Professor Owen is right in assigning them all to a single individual.

"Sir E. Home imagined that the glenoid cavity of the scapula was too small in proportion to the head of the corresponding humerus, and that a detached olecranon belonged to a still smaller individual. But as regards the scapula in question, there does not appear to be any reason to concur in this suggestion; and as I have been unable to find the detached olecranon, I can offer no opinion respecting it. Most of the other epiphyses of the large bones are detached, which is in favour of the supposition that the ulna may have formed part of the same skeleton, of an individual which had not attained to full maturity.

"It should be observed, however, on the point of age, that the complete union of the distal epiphysis of the humerus and of that of the metacarpals, and the much worn condition of the teeth, show that the animal must have reached pretty nearly its full stature; and if the rate of the development of the bones was the same as in the Elephant, it was probably somewhere about twenty years old. It must be confessed, however, that the teeth, for some reason, appear to be rather unduly worn for that age.

"Sir Everard Home, as might be expected from the period at which he wrote, made no attempt to discriminate the

* "In 'British Fossil Mammals' (p. 343), it is stated, with reference to the Rhinoceros-bones, that most of the parts recovered from this cavern were determined by Mr. Clift. But this does not appear to be the case. The remains described, and so beautifully figured by Mr. Clift, are those which occurred in the third set of 'caverns' in the year 1823, and which, as above stated, did not afford any Rhinocerine remains. The bones forwarded to Sir Joseph Banks were 'determined' by Sir Everard Home, and not by Mr. Clift."

species to which the remains belonged, unless we may interpret his expression respecting the tooth found in the second cavern as implying that he regarded them as belonging to *Rhinoceros unicornis*. Nor does Cuvier, when referring to Sir Everard Home's paper, make any remark on this point.

"In the 'Catalogue of Fossil Mammalia,' however, they are assigned to *Rhinoceros tichorhinus*; and Professor Owen, in 'British Fossil Mammals' (p. 343), notices and partially describes them under the head of that species, with which, in fact, they appear to have been associated by all palaeontologists who have since had occasion to refer to them, with the exception of Dr. Falconer, who seems to have fully recognized the non-tichorhine character, at any rate, of the teeth. But he has left no remarks respecting the other bones.*

"It nevertheless appears to me abundantly clear that neither the teeth nor the bones present any tichorhine character, but, on the contrary, that they are plainly referable to the widely different great southern form, *R. leptorhinus*, Cuv. (*R. megarhinus*, Christ.)

"The Oreston collection therefore acquires very great interest, not only as adding another to the as yet scanty instances of the occurrence of that species anywhere in Britain, but more especially as affording the only recorded example of its discovery in a cavern of any kind—a fact the more remarkable, perhaps, since no vestige of its remains has occurred in the Brixham cave, nor has as yet, I believe, been detected in Kent's Hole, where, more particularly, we might have expected to meet with an associate of the *Deprandon* [i.e. *Machaeroctes*].

"I will now proceed to state the proofs which appear to me calculated to support the conclusion at which I have arrived.

"Most of the specimens are much broken, and consequently but ill fitted, more especially in the case of the genus *Rhinoceros*, for the determination of specific characters; but amongst them are several which will amply suffice for the purpose;

* "It is only since my attention was lately directed to these remains, that I noticed a brief remark extracted from one of his note-books, and given in his invaluable 'Palaeontographical Memoirs' (vol. ii. p. 353), which shows that his acute and practised eye had long ago (1859) discovered the distinction between the Oreston teeth and those of *R. tichorhinus*. His words are, 'they are quite unlike *R. tichorhinus*; and I believe they agree with *R. hemitæchus*'.

"Although unable, for reasons herein assigned, to agree with my lamented friend in the latter supposition, it was very satisfactory to find that my own opinion regarding the non-tichorhine relations of the teeth was supported by his eminent authority."

and it is to these only therefore that I shall confine what I have to remark.

"1. The Teeth."

"The collection, as it exists in the College Museum, includes six molars—three maxillary and three mandibular. Of the former, two, though much injured, are sufficiently perfect to afford good characters, the third is too imperfect to be of any use.

"The most characteristic teeth are the two upper molars (numbered 877 and 878); and they are clearly the opposite teeth of the same individual. As to their place in the series, opinions may very properly differ. In the Museum Catalogue they are described as the first molar (*m* 1); and Dr. Falconer, in the note above referred to, also appears to have assigned that position to them. I am myself, however, more inclined to regard them as the second molar (*m* 2) The point, however, is not one of any great importance.

"Both the teeth, as before remarked, are much worn—the remaining height of the crown from the root of the fangs, measured on the dorsum, being about 2 inches.

[A considerable amount of technical, but most valuable matter is omitted here.]

"2. Other Bones."

"Most of the bones, as I have said, are in a very fragmentary condition; but amongst them are one or two which are capable of affording excellent characters, and are, in fact, alone sufficient, as it seems to me, to determine the species to which they belong.

"The first of these is a right middle metacarpal, (No. 905 in the Catalogue). The bone is nearly perfect; and its growth is completed, inasmuch as no trace remains of the junction between the shaft and the epiphysis.

"Regarded with respect either to its size or to its form and proportions, this bone differs so strikingly at first sight from the corresponding bone in any other species of Rhinoceros, recent or extinct, with which I am acquainted, that it is surprising its true specific relation should have been so long overlooked. First, as regards its size. The Oreston bone is nearly 1·5 inch longer than the largest specimen of *R. tichorhinus* of which I have any knowledge, and, in the second place, it nearly corresponds in length with the metacarpal of *R. leptorhinus*, as shown in two specimens from Grays Thurrock, in the British Museum. As regards the other dimensions, it will also be seen considerably to

exceed those of *R. tichorhinus**—as, for instance, in the size of the two extremities, and especially in the transverse diameter of the distal articular surface or trochlea, which may be regarded as affording a pretty certain term of comparison. With respect to the least circumference of the shaft, it is true that in one instance of *Rhinoceros tichorhinus* that has come under my observation, from the river-gravel at Stratford-on-Avon, the circumference is greater; but this is owing to the circumstance that that bone appears to be one in which the muscular ridges on the hinder surface are very much developed, and the whole bone unusually thick. The Oreston bone is thus satisfactorily shown to be much larger in every way than that of *R. tichorhinus*.

"But this is not all; it is not only much larger, but it differs still more remarkably in its proportions." [The author then directs attention to his Table, showing] "how much slenderer, and how very much more compressed or flattened, is the metacarpal of *R. leptorhinus* as compared with that of *R. tichorhinus*."

"From the above consideration, I think it impossible to avoid the conclusion that the Oreston metacarpal can only belong to *R. leptorhinus*."

[After some remarks on the perfect distal extremity of the right inner metatarsal, the author thus concludes]:—

"I have carefully surveyed the other bones in the Oreston Collection, but think it unnecessary to say more concerning them than that they seem to be all in accordance, as regards proportions, with the metacarpal and metatarsal, hoping that what I have ventured to remark concerning those bones and the teeth will be enough to establish the proposition with which I started."

[To the paper is appended the following report of the]
"DISCUSSION.

"The Chairman" [R. A. C. Godwin-Austen, Esq., F.R.S., Vice-President] "remarked that at one time the Oreston *Rhinoceros* was referred to *R. tichorhinus*, but that Buckland, although mentioning the *Rhinoceros*, never gave it a specific name. The Chairman also said that the Oreston fissures were not caves, but mere fissures which had been filled in; an entire skeleton occurred at one spot, and the animal must have fallen in.

"MR. BOYD DAWKINS had been struck by the non-ticho-

* [A Table of measurements accompanies the paper, but is not copied here.]

rhine character of the Oreston specimens some years since. He confirmed Prof. Busk's determination.

"PROF. BUSK, in reply, stated that the Oreston was a fissure-cavern, and noticed the successive openings in 1816, 1821, and 1826. He did not know of the occurrence of two species of Rhinoceros at Oreston."

[It is obvious that the Oreston caverns have occupied the pens of a large number of writers, and that they have produced a somewhat voluminous literature. It may not be out of place to give here, in chronological order, a list of the authors quoted in the present compilation:—

Authors.	Dates.	Authors.	Dates.
Home	{ 1817 1821	De la Beche	1839
Whidbey	{ 1820 1822	Claringbull	1840
Buckland	{ 1822 1824	Owen	{ 1843 1845
Clift	1823	Pengelly	1859
Cottle	1829	Hodge	1859
Hennah	1822 to 1835	Falconer	1859
Bellamy	{ 1835 1839	Dawkins and } Sanford	1866
		Busk	1870

It may be of service, in conclusion, to give a list of the different kinds of mammals found in the Oreston caverns with the names of the authorities for their determination. The names of those specifically identified will be placed before those which have not.

Scientific Names.	Common Names.	Authorities.
1 <i>Ursus priscus</i> . Goldfuss	Grizzly Bear	Owen
2 <i>U. spelæus</i> . Blumenbach	Great Cave-Bear	Owen
3 <i>Putorius ermineus</i>	Weasel	Clift & Cottle
4 <i>Canis lupus</i> . Owen	Wolf	Clift
5 <i>Vulpes vulgaris</i> . Brisson	Fox	Clift
6 <i>Hyæna spelæa</i> . Goldfuss	Cave Hyæna	Owen
7 <i>Felis spelæa</i> . Goldfuss.	Cave Lion	Owen
8 <i>Rhinoceros leptorhinus</i> . Cuvier	Slender-nosed Rhinoceros	Busk
9 <i>Elephas primigenius</i> . Blumenbach	Mammoth	Bellamy
10 <i>Equus fossilis</i> . Von Meyer	Fossil horse	Owen
11 <i>E. plicidens</i> . Owen	Horse with plicated tooth	Owen
12 <i>Asinus fossilis</i> . Owen	Fossil Ass or Zebra	Owen
13 <i>Bison minor</i> . Owen	Lesser Bison	Owen
14 <i>Bos longifrons</i> . Owen	Long-fronted ox	Owen
15 <i>Hippopotamus</i> .	Hippopotamus	Bellamy
16 <i>Sus</i> .	Hog	Pengelly
17 <i>Ovis or Capra</i> .	Sheep or Goat	Hodge
18 <i>Cervus</i> .	Deer	Hodge
19 <i>Camelus</i> .	Camel	Hodge
20 <i>Giraffa</i> .	Giraffe	Hodge
21 <i>Rongeurs</i> .	Rodent, size of Mouse	Hodge]

A FEW REMARKS ON AN ANCIENT BRITISH COIN FOUND ON NORTHERNHAY, EXETER.

BY H. S. GILL.

(Read at Exeter, July, 1872.)

IN November, 1871, a man was planting some shrubs on Northernhay, near the back of the County Assize Courts, when the coin now produced was brought to the surface.

This is an interesting fact, showing that the aboriginal inhabitants of this district were located in Exeter before its occupation by the Romans, and that they had a currency of their own in circulation.

British coins of a similar type have been found at Mount Batten, near Plymouth, and one of them is engraved in Hawkins's work on *The Silver Coinage of England* (see plate i., No. 14), which is described by him as being of "very base metal." Mr. Evans, in his excellent work on *The Coins of the Ancient Britons*, calls this "the Channel Islands type," because in 1820 a hoard of nearly one thousand was discovered in Jersey. In plate i., No. 8, he gives an engraving of a coin almost identical with this, which he states was found in Devonshire; and he further remarks, on the authority of Mr. C. Roach Smith, that "they are often found on the southern and south-western coasts of England." The weight of this Northernhay coin is 104 grains. It has on the obverse what is intended to be a head in profile, looking to the right. The eye, ear, and outline of the nose are tolerably well defined, but the mouth and chin are indistinct. The hair is represented in a peculiar manner, being arranged in three curved bands, each of them consisting of curled locks, the spiral ends of which appear round the head. In front of the nose is a detached object, which may have been put in by way of ornament.

On the reverse is a strange figure of a horse, without either head or tail! The fore legs are similar in shape to

the hind ones, only bent in an opposite direction, and between the legs is an ornament in shape like a lyre.

It is probable the lyre may have been used on some of the Macedonian staters, from which the designs upon the British coins appear to have been copied. Behind the dismembered horse is the shadowy outline of a driver, apparently holding some reins to guide the horse, which evidently was borrowed from the well-known type of Victory driving a biga.

Unfortunately an act of vandalism has been perpetrated on the coin, the outer edge having been hammered nearly all round, thereby obliterating a portion of the device on both sides, especially on the reverse; but it does not appear to have been done since the coin was exhumed, because there is the rust of ages over the battered part.

Mr. Evans, in the work before quoted, avows his belief that the *earliest* of the British coins were struck about 200 years B.C.; and assuming that the Rev. R. Kirwan's theory be correct (which I believe it is), that these coins gradually declined in the attempt to copy the elegant gold staters of Philip of Macedon, then this one would be more ancient than the five now in our City Museum, on which, as Mr. Kirwan observes, "almost all resemblance to the original is lost";* and if it were struck, say 130 years B.C., then it would be just over 2000 years old.

The metal of which these coins are composed is billon, or base silver, and from an analysis made of one by De Caylus, it was found to contain—

Silver	·1770	parts.
Copper	·7954	"
Tin	·0265	"
Iron	·0009	"
Gold	·0002	"
<hr/>		
	1·0000	

It is my intention, before I leave Exeter, to present this interesting old coin to the Royal Albert Museum, and ask the Curator to place it in the same case with the five British coins already there.

* See "Report and Transactions of the Devonshire Association" for 1869, page 600.

ON FABLES AND FABULISTS IN CONNECTION WITH JOHN GAY.

BY SIR JOHN BOWRING, LL.D., F.R.S., ETC.

(Read at Exeter, July, 1872.)

A DEVONIAN, born in 1688, near Barnstaple, rose from the low estate of a mercer's apprentice to be the secretary of the Duchess of Monmouth, and afterwards of Lord Clarendon, when he was ambassador to Hanover, through whom he was introduced to the Prince of Wales, who for some time was his patron, but who managed to forget his *protégé* when he mounted the throne. At the age of twenty-one he wrote his first piece, *Rural Sports*, which he dedicated to Mr. Pope, with whom he became afterwards allied in intimate friendship. The neglect he experienced from his royal master so sorely wounded him that it is supposed to have shortened his life, though his literary successes brought him large profits, and his wit and agreeable manners had introduced him to an extensive circle of distinguished and literary personages. Indolence seems to have been his besetting sin. His latter days were passed in the household of the Duke of Queensberry, where he became a great favourite. He died in 1732, and was buried in Westminster Abbey, where the monument erected to his memory bears an inscription written by Pope. A mock-heroic piece, entitled *What d'ye call it?* was brought out in 1715, and had great popularity; but that popularity was far exceeded by *The Beggar's Opera*, which was acted for sixty-three days. His fables still maintain their hold, especially among the young. The second part was written for the amusement of the infant Duke of Cumberland, and this has a political character. As in the case of the Delphin Classics collected for the Dauphin of France, it was not unusual for books to be provided for the special use of royalty. Gay published *The Shepherd's Week*, which is a fair picture of rural life—an admirable contrast to the

absurd pastorals which from the time of the eclogues of Virgil had a certain hold upon the public, but which succumbed under the ridicule with which they were covered, principally by the classical writers of France. *Trivia; or, the Art of Walking the Streets of London*, is well described as a clever and spirited example of the mock-heroic. His *Black-eyed Susan* is still sung by sailors with great enthusiasm.

There has been an attempt to throw ridicule upon fables as unnatural; Cowper, himself a fabulist, wittily says—

“I shall not ask Jean Jacques Rousseau,
If beasts confabulate, or no;
‘Tis clear that they were always able
To hold discourse—at least in fable.”

Fables have been the charm of all ages and of all peoples. Pilpay among the Orientals, Æsop among the Greeks, Lafontaine among the French, and Gay our own poet, occupy high places in the temple of fancy. And their narrations are specially characteristic of the times in which they lived, and of the society by which they were surrounded.

Æsop the Greek slave must be deemed the most illustrious of fabulists. He lived in the sixth century before Christ, the contemporary of Solon and Pisistratus: the fables are moral lessons. Maximus Planudes, a Constantinopolitan monk, wrote in the fourteenth century a biography of Æsop, filled with inventions and exaggerations; for as regards Æsop's personal appearance, though all authorities concur in representing him as deformed, there is no reason to believe him to have been the hideous monster described by the monk. The place of Æsop's birth is unknown—or disputed like that of Homer—among several cities. That he was a slave is certain—an educated slave; for his Greek is pure, and his literary reputation so great that he was invited by Croesus to the Lydian court. There he is said to have encountered Solon, and to have reproved him for his uncourtly way of inculcating his moral lessons. He was redeemed from slavery in the latter part of his life, and his merits, it is said, were often contrasted with those of his master, Xanthus. His style became popular, and was known as Æsopian.

Phædrus reports that he composed the fable of “Jupiter and the Frogs” for the amusement of the citizens. He was charged with a mission for the distribution of money at Delphi; but finding the intended objects of the grant unworthy, he returned the money to the donor. The disappointed party got up a charge of sacrilege, and put Æsop to death. A famine ensued, which was considered the punishment inflicted

by the offended deity for the cruel injustice they had perpetrated, and they offered to make compensation to any of his descendants ; but none appearing to claim it, the money was paid to a grandson of his master, Tadmon. Herodotus is our authority for this singular tale, and there is no reason for doubting its truth. He died, according to Newton's chronology, in the fifty-seventh or fifty-eighth olympiad, and the Athenians erected a statue to his honour, from the hand of the celebrated sculptor Lysippus.

"There is abundant proof," to use the words of the *Penny Cyclopaedia*, from which most of our materials have been taken, that fables passing under the name of *Æsop* were current and popular in Athens during the most brilliant period of its literary history, and not much more than a century after the death of the supposed author. The drolleries of *Æsop*, Αἰσωπικὰ γέλοια, are mentioned by Aristophanes in terms which lead us to suppose they were frequently repeated at convivial parties. Socrates, in prison, turned into verse 'those which he knew ;' and Plato, who banishes the fictions of Homer from his ideal republic, speaks with high praise of the tendency of those of *Æsop*. Demetrius Phædreus made a collection of *Æsopian* fables, and we hear of two metrical versions of them, one by an anonymous author, another by Babrius. Phædrus published a collection of fables in Latin verse, in the time of Tiberius, the materials of which he professes to have taken from *Æsop* ; and it is not improbable that the nearest approach to the substance of the original apologetics may there be found. There is another collection, written in elegiac verse, in the fourth century, by Avienus."

It is scarcely credible that the prose fables, such as we have them now, came in their present state from *Æsop's* hand ; but those which substantially agree with the fables of Phædrus, the oldest to which we can assign a certain date, have a prominent claim to authenticity. Their total number is from 290 to 300. Planudes published 144, of which, probably, he was himself the author. There is another collection printed from the MSS. at Heidelberg, by Neveletus, in 1610. None of these MSS. contain the Planudian fables ; and the editor thinks they are the work of different hands. Allusions to the monks and the monastic life prove their more modern date. This edition, a sort of *Corpus Fabularum*, contains 297 fables attributed to *Æsop*, and 40 of the rhetorician Aphthonius, who lived in the third century, besides various metrical versions in Greek and Latin.

Lokmân is spoken of in the Koran, and by later Arabic

traditions, as a celebrated philosopher contemporary with David and Solomon, with whom he is said to have held interviews. He is represented to have been of the ancient tribe of Ad; or, according to another account, was the king of that tribe; and when it was destroyed by the Seil al Arin, he was preserved on account of his wisdom and piety. But the Persian authorities pourtray him as an Abyssinian slave, noted alike for deformity and wit, having a special talent for the composition of moral fictions and short apologetics. A collection of Arabic fables bears his name. The resemblances in their history encourage the belief that he and Æsop were the same person. The fabulous history of the fabulist, written by the Constantinopolitan monk, has engrafted many stories on the few circumstances narrated by the Greek. It has been well remarked that the fables of Æsop little resemble ancient original Greek compositions. Many of them are strongly marked with an Oriental character. They bear a striking resemblance to the Indian fables in the Panchatantra, alluding to Asiatic manners and customs; and animals are mentioned in them, such as peacocks and monkeys, which are only found in Upper Asia. The Indo-Persian origin is clearly traceable; and from the same source is derived the fabulous work attributed to Syntipas, the Sinbad of the Arabian Nights, and other similar productions of the middle ages.

Evidence will be found of the later and traditional origin of Lokmân's fables. Modern words have replaced more ancient ones—the style is easy and flowing—and the fables have been reprinted, with a Latin text for the use of students, by Espenms [Leydon, 1615]. Boissonadès Præf.: ad Syntipam, and Graomets de Æsopo et Fabulis Æsopicis, may be consulted by the curious.

According to Snidas, Babrias or Babrius wrote a collection of Æsopian fables in ten books, which he turned from prose into Choliambic verse. Avianus, in his preface to the fables, says they were contained in two volumes, or rolls of papyrus. It is believed that Babrius lived shortly before the Augustan age; but little is known of his history. There have been divers collections of the fables and fragments of Babrius; the best account is to be found in an article in the *Philological Museum*, vol. i. p. 280–304. The language is admired for its terseness and elegance; his narrations are simple and flowing. About twenty of them have been preserved, and they are deemed equal to those of the best of our modern fabulists.

Among these La Fontaine undoubtedly occupies the highest place. Jean de la Fontaine was born in 1621, at Chateau Thierry. On hearing an ode from Malherbe, he is reputed to have exclaimed, "I too am a fool!" He translated Terencès Eunuch; he was improvident, careless, and for his own epitaph wrote, "I was occupied in sleeping and doing nothing." Fouquet became his patron, and gave him a pension. He was domiciled with Madam Gableen, who, having dismissed her servants, said, "I have retained three of my animals—my cat and La Fontaine. He was constantly distressed by, and frequently relieved from, pecuniary embarrassments. He was humiliated by being required to make an apology for a comedy called "licentious" by the priests who were exposed in it. He afterwards became a devôt, translating hymns and other religious works. His tales have little merit. His fables have preserved all their popularity, and have gone through countless editions—ornate and economical.

He is not original, nor does he profess to be so; but the ease and grace of his style have been rarely, if ever, equalled. La Harpe says his merits are not to be described; for if, after a profound philosophical investigation, we arrived at the ultimate causes of excellence, and referred the point to La Fontaine himself, the *bon homme* would say, "I know nothing about this; I wrote them as my humour dictated, and that was all."

The fables of Æsop, familiar to all the world, and those of Gay, well known to the English races, need no notice here; but a familiar translation from some of La Fontaine's, the most popular of Continental fabulists, may not be misplaced here. I also give one of Krilov's, whose writings do honour to the anthology of Russia.

LE CORBEAU ET LE RENARD.

Good Master Crow, perched high upon a tree,
Held in his beak a cheese.
Good Master Fox the dainty morsel sees,
And to the crow addressed his flattery.
"Good morning, Master Crow. A lovely day!
How charmingly you look! how bright and gay!
Oh, if your voice be half as sweet
As is your plumage shining, you would beat
The fairest phoenix from the field;
All other birds must soon the victory yield."
And such enchantment did the flattery bring,
That the poor crow, alas! began to sing,
And soon the cheese dropt down too speedily.
The fox seized on it, shook his crafty head,
And to the astonished crow most gravely said:

" Beware of flatterers! for on flattery
 They live; and very little will it matter
 If by the loss you should but learn
 From the kind friend the flatterer to discern."
 The crow, though sometime late, resolved that he
 Would not again be duped by flattery.

La Fontaine.

LE CHARLATAN.

Oh, in this busy world what quacks we see!
 For quackery,
 Aided by fools, however mocked by sages,
 Has in all ages
 Sounded its trump, and made a gorgeous show
 Solemn as death, loud-voiced as Cicero.
 One of these charlatans professed to be
 Of eloquence the model,
 And lustily proclaimed that he
 From the most stupid noodle—
 A fool's, a bumpkin's, nay, that from an ass—
 He would elicit language to surpass
 Demosthenes himself—nay, bring to me
 Of asses the most asinine: his bray
 Shall drive all competition far away.
 The prince, who had the marvellous history heard,
 Sent to the oracle a word,
 That of his services he'd special need.
 " My stable," said he, " has a noble steed
 From Arcady, and him I fain would make
 An orator—and no mistake."

La Fontaine.

LA CIGALE ET LA FOURMI.

A grasshopper, the summer long,
 Sang his gay song;
 And sadly was bereft
 When the warm summer left
 Not even a worm or fly
 His hunger to supply.
 He hasten'd to his neighbour ant
 To help him in his want;
 And till the harvest days
 For a few grains he prays.
 I'll pay you back, and pay
 With interest ere the day.
 Whate'er his virtues be,
 The ant's no lender; he,
 If fault he have, not this
 Was e'er considered his.
 What, said he to the comer,
 What did you in the summer?
 What did I? Why my voice
 Made all the world rejoice.
 You sang, I'm glad to hear—
 Now you may dance, my dear.

La Fontaine.

KRILOV.

THE SWAN, THE PIKE, AND THE CRAB.

If harmony be wanting to your plans,
 Vain are your efforts—yours, or any man's;
 They end in disappointment all alike.
 I once observed a swan, a crab, a pike,
 Drawing a treasure, all their power, their will,
 Exerted, yet it stood unmoved and still.
 'Tis not its weight—its weight is very little;
 Three powers at work, it budgea not a tittle.
 The swan would fain soar upwards in its pride,
 The crab draws back, the pike to the waterside.
 Who of the three was wrong, and who was right?
 It might be all—it might be none—it might.

Russian Anthology.

KHEMNITZER.

Another Russian poet, Khemnitzer, took La Fontaine for his model. His fables teem with bitter satires on the habits and institutions of his country, not wholly unapplicable to other countries than Russia.

THE LION'S COUNCIL OF STATE.

A lion held a court for State affairs.
 Why? That is not your business, sir—'twas theirs.
 He called the elephants for councillors; still
 The council-board was incomplete,
 And the king deemed it fit
 With asses all the vacancies to fill.
 Heaven help the state! for lo! the bench of asses
 The bench of elephants by far surpasses.
 "He was a fool, theforesaid king," you'll say;
 "Better have kept those places vacant, surely,
 Than fill them up so poorly."
 Oh, no; that's not the royal way;
 Things have been done for ages thus, and we
 Have a deep reverence for antiquity.
 Nought worse, sir, than to be, or to appear,
 Wiser and better than our fathers were.
 The list must be complete, although you make it
 Complete with asses; for the lion saw
 Such had for ages been the law:
 He was no radical to break it.
 "Besides," he said, "my elephants' good sense
 Will soon my asses' ignorance diminish;
 For wisdom has a mighty influence."
 They made a pretty finish!
 The asses' folly soon obtained the sway,
 The elephants became as dull as they.

ANOTHER'S INFLATION.

I saw a long, long train,
 Of many a loaded, lingering wain;
 And one there was of most gigantic size,
 It looked an elephant midst a swarm of flies.

It rolled so proudly that a passenger
Curiously asked, "Now what may that contain?"
"Nothing but bladders, sir."
Such masses (misnamed men!) are both rare—
Inflated, bullying, proud, and full of—air.

Æsop's fables were the subject of Luther's admiration. He wrote to Melancthon that he would raise three historical tabernacles—one to the psalmist, one to the prophets, and one to Æsop. And again he said, "After the Bible, I know no better books than Æsop's fables and the writings of Cato."

Among ancient fabulists Phædrus must not be passed over in silence. A Thracian by birth, he was brought as a slave to Rome. He mastered the language, and was emancipated by Augustus. He made Æsop his model, and his fables have long been praised for "the graceful simplicity of their style, the pointedness of their humour, and the general soundness of their morality." The latest edition was published at Zurich, in 1832. Soon after some additions were printed at the same place. Bentley also edited the fables, and added them to his edition of Terence.

Mr. J. R. Chanter, in his *Literary History of Barnstaple* has added something from local sources to our knowledge of Gay's history. Our fabulist appears to have been patronized by Robert Luck, the master of the Grammar School, a poet, or at least one who wrote Latin and English verses, in one of which, *The Female Phæton*, he depicts a fast young lady of fashionable life. The Gay family had been settled in Barnstaple from the beginning of the 16th century. Richard Gay was mayor in 1542, and the fabulist's grandfather, Anthony, in 1638. Gay's father, William, died in the early days of his son, who lived with his mother, in Ivy Street. He was bound apprentice to a London firm; but his health failing, returned to Barnstaple, where he dwelt with his uncle, the Rev. John Hanmer, a Nonconformist divine of some local celebrity. The success of *The Beggar's Opera*, when exhibited by Rich (who had been till then unfortunate in his theatrical enterprises), was celebrated in this eulogium—"It has made Gay rich, and Rich gay." All that is known about him is to be found in a little work called *Gay's Change*, written by his nephew, the Rev. Jos. Ballard. It contains an until then unpublished poem, which (omitting some rather gross illusions) might be reprinted by the advocates for woman's rights. It is entitled "The Ladies' Petition to the House of Commons." It may interest Exonians to hear a few extracts—

Sirs,—We, the maids of Exon's city,
 The maids—good lack! the more's the pity!—
 Do humbly offer this petition
 To represent our sad condition,
 Which, once made known, our hope and trust is
 Your honoured House will do us justice.
 First you shall hear—but can't you guess—
 The reason of our sad distress?
 A maiden was designed by nature
 A weakly and imperfect creature,
 So liable to err and stray,
 She wants a guide—requires a stay:
 And then, so timorous of sprites,
 She dreads to be alone at nights.
 Say what she will, do what she can,
 Her heart still gravitates to man.
 From whence 'tis evident as light,
 That marriage is a woman's right;
 And therefore 'tis prodigious hard,
 To be of such a right debarr'd.
 Yet we, poor souls! can't have the freedom
 To get good husbands, though we need 'em.
 The widows, sirs! their art denotes,
 They're *Machiavels* in petticoats.
 The plaguees, with heads on mischief running,
 Exceed by far the fox in cunning;
 They cut us out, are still before us,
 And leave no lovers to adore us.

* * * *

For when by force of all our wits,
 Kind looks, soft words, and fainting fits,
 We've brought our beaux just to the lure,
 And think our captives are secure;
 When the ring glitters in our eye,
 The lawyer called, the parson nigh,
 Up starts a widow in the way,
 And disappoints us of our prey.
 Besides, what makes it most provoking,
 The dames oft wound us by their joking,
 Calling us sneeringly old maids.
 Old maids indeed!
 While thus the widows interlope,
 How can we maidens live in hope?
 Your learned House will then debate
 On our most lamentable state;
 And after hearing this as fact,
 Will guard our rights by legal act.
 But lest your honours should surmise
 That we, more resolute than wise,
 Make 'gainst the widows an invective,
 When 'tis ourselves are most defective.
 We state (and them for favour sue)
 That all that *can* be done we do—
 We plot, devise, by every plan,
 To win the fickle creature, man,
 Contriving or pursuing schemes,
 Not more in waking than in dreams;
 At every moment, every place,
 Our lures we're throwing with a grace.

In curtseying, smiling, nodding, talking,
 In laughing, singing, dancing, walking,
 In romping, frowning, ogling, dressing,
 And fifty things that want expressing,
 At home, abroad, by night, by day,
 We our own stratagems display.

* * * * *

Yet sirs, in spite of our cares,
 Our melting eyes and plaintive airs,
 We must allow, when pressed thus far,
 Just what we were at first we are.
 All means have failed, all plans miscarried,
 And we, alas ! are still unmarried.

* * * * *

Since then 'tis not our fault, but fortune,
 We take the freedom to importune.
 Your house will, let it be enacted,
 That not one widow be contracted ;
 Or that it henceforth may be reckon'd,
 She killed the first who weds the second,
 Till every maid is in the way
 Of wedlock's life as well as they.

* * * * *

Grant them this suit, Exonian spinsters say,
 And your petitioners will ever pray.

Gay's fables are so well known that it would be superfluous to introduce more than a single specimen. Those in the second part of the collection, published after his death, have neither the point nor the brevity of those printed in his lifetime, and probably were not deemed by him worthy of preservation.

THE BARLEY-MOW AND THE DUNGHILL.

How many saucy airs we meet
 From Temple-bar to Aldgate Street !
 Proud rogues who shared the South-sea fray,
 And sprung, like mushrooms, in a day !
 They think it mean to condescend
 To know a brother or a friend ;
 They blush to hear their mother's name,
 And by their pride expose their shame.

As cross a yard at early day
 A careful farmer took his way,
 He stopp'd, and, leaning on his fork,
 Observ'd the flail's incessant work.
 He thought he measured all his store ;
 His geese, his hogs, he numbered o'er ;
 In fancy view'd the fleeced shorn,
 And multiplied the next year's corn.

A Barley-mow which stood beside,
 Thus to its musing master cried :
 " Say, good sir, is it fit or right
 To treat me with neglect or slight ;
 Me who contribute to your cheer,
 And raise your mirth with ale and beer ?

Why thus insulted, thus disgraced,
And that vile Dunghill near me placed?
Are these from sweepings of a groom,
That filthy sight, that nauseous fume,
Meet objects here? Command it hence;
A thing so mean must give offence."

The humble Dunghill thus replied:
"Thy master hears and mocks thy word;
Insult not thus the meek and low;
In me thy benefactor know.
My warm assistance gave thee birth,
Or thou hadst perished in the earth;
But upstarts, to support their station,
Cancel at once all obligation."

SIR THOMAS BODLEY.

BY SIR JOHN BOWRING, LL.D., F.R.S., ETC.

(Read at Exeter, July, 1872.)

IT was a fine compliment paid by a great warrior to an illustrious jurist : "While some have enlightened minds, you have enlightened libraries." Among the most distinguished of the benefactors of mankind must be reckoned those who have gathered together the greatest amount of knowledge, intellectual and moral, from the vast mines in which have been deposited the harvestings of the great and good ; who have collected together the vestiges which have been left by the sages and the philosophers, who from time to time have represented "the high intellects" which mark the progress of successive cycles. If the ineffable stigma of barbarism be attached to the name and the memory of Omar, the destroyer of the Alexandrian Library, let contrasted honour and glory be attached to the memories of men like Sir Thomas Bodley, the saviour, the renewer, the gatherer, the distributer of that light which beams from generations that have passed away, and which are best remembered by the noble works they communicated to their own generation, and to all that follow them.

I do not know that I can do better than to use the materials furnished by the article on Sir Thomas Bodley, which I find in the *Penny Cyclopaedia*; but I subjoin an answer to some local inquiries, with which I have been favoured by my friend Mr. Robert Dymond, and have obtained the latest reliable information from Macray's *Annals of the Bodleian*, 1868 :—

"Exeter, 1st March, 1872.

"MY DEAR SIR JOHN,—

"I regret to find that my notes of the Bodleys of Dunscombe are very scanty, and refer almost exclusively to printed sources of information with which you are familiar, such as Westcote, Risdon, Prince, Athen Oxon, &c. You, no doubt, have Dr. Oliver's account of Sir Thomas Bodley in his *Biographies of Exonians*, which, by the way, deserve a better position than the columns of a newspaper.

"Do you know Dunscombe ?—a large farm-house, still showing, I think,

traces of former importance. It is on the Crediton road, about a mile beyond Newton St. Cyres, and belongs to Mr. Buller of Downes.

"The Benchers of the Inner Temple are desirous of attaching some biographical notices to the names in the long list of students of their Inn; and in preparing some notes on the Devonshire names, I found that '*George Bodleigh, of Crediton*,' entered as a student in 1554. This was probably the cousin of Sir Thomas, who married Agnes Hunt. (See Prince, 92-103.) The name of Bodleigh does not reappear in the Inner Temple lists between 1547 and 1651.

"In *Chamberlain's Letters* (Camden Society's Pubs.) will be found a reference to a 'great confluence of cutpurse, whereof ensued many losses and shrewde turnes; as, first, Mr. Bodley lost his clokke' (cloak, I suppose). 'Sir Richard Lea 2 jewells of 200 markes, which Sir Harry Lea and he meant to have bestowed on the bride, Mr. Tanfield's daughter.' This alludes to the marriage of Sir Henry Cary with the daughter of Chief Baron Tanfield in 1602.

"Sir Thomas Bodley is said to have married Ann, widow of Nicholas Ball, of Totnes, and daughter of — Cary, of Bristol (Prince says Carew). There is a copious pedigree of the Bristol Carys in the *Heralds' College*, 3d. 14. I have only a copy of the eldest line, which runs thus:—

*William Cary, Sheriff of Bristol, 1546.
Will proved P.C.C. 20 June, 1592 =*

*Richard Cary, eldest son, merchant, of Bristol.
Buried at St. Nicholas' Church. Born 16 June, 1570. Will at P.C.O. =*

First wife, Elizabeth =	<i>William Cary</i>	=	Alice Goodall	=	Mary,
	of Bristol, draper.		Walter Cary,		daughter of
	Bap. 3 Oct., 1550.		and others.		Gregory Llewellyn,
	Bur. 1 Mar. 1632.				of Kenisham.
Richard Cary (second son, but eventual heir), of Bristol, draper.	=	Mary, daughter of Nicholas Shershaw, of Abergavenny.			
Bap. 4 Aug., 1579.					
William Cary =	<i>Mary</i>	=	<i>Shershaw Cary</i> =		Mary, daughter of
	daughter of Jno. Scrope, of Castle Comb, Co. Wilts,				Hugh Yeo, of Bristol.
	Esq. (by Mary, daughter of John Hungerford, of Cadenham).				D. 4 Oct., 1680.
	Bur. 4 Apr., 1651.				
			<i>Richard Cary, of London, Esq.,</i> <i>Director of Bank of England. Living 1715.</i> <i>His daughter Martha married Elwes.</i> <i>(See Burke's <i>Landed Gentry</i>.)</i>		

Sir Thomas Bodley, from whom the Bodleian or public library at Oxford takes its name, was the eldest son of Mr. John Bodley, of Exeter, by Joan, daughter and heiress of Robert Hone, Esq., of Ottery S. Mary. By his father's side he was descended from the ancient family of the Bodleys, or Bodleighs, of Dunscombe, near Crediton.* He was born at Exeter, March 2nd, 1544. He was about twelve years of

* Mr. Dymond says that the large farm-house called Dunscombe still shows traces of its former importance. It is on the Crediton road, about a mile beyond Newton St. Cyres, and now belongs to Mr. Buller of Downes. He directs attention to Dr. Oliver's "Biographies of Exonians," which deserves more notice than it has obtained, and I extract from it some local notes.

age, when his father, being obliged to leave England on account of religion, settled with his family at Geneva, where he lived a voluntary exile during the reign of Queen Mary. In that university, then newly erected, young Mr. Bodley applied himself to the study of the learned languages and divinity, under the most celebrated professors. He frequented the public lectures of Chevalierius on the Hebrew tongue, of Beroaldus on the Greek, and of Calvin and Beza on divinity, and had also domestic teachers in the house of Philibertus Saracenus, a physician of that city, with whom he boarded, where Robert Constantine, author of the Greek Lexicon, read Homer to him. Upon the accession of Queen Elizabeth, in 1558, he returned to England with his father and family, who settled in London, and was soon after sent to Magdalen College, Oxford, where he was placed under the tuition of Dr. Humphrey, afterwards president of that society. In 1563 he took the degree of B.A., and was chosen probationer of Merton College the same year, and the year following was admitted fellow. In 1566 he took the degree of M.A., and in the same year read natural philosophy in the public schools. In 1569 he was elected one of the proctors of the university, and after that for a considerable time supplied the place of university orator. Hitherto Mr. Bodley had applied himself to the study of various faculties, without any inclination to profess any one more than the rest. In 1576, being desirous to improve himself in the modern languages, and to qualify himself for public business, he began his travels, and passed nearly four years in visiting France, Germany, and Italy. Afterwards, returning to his college, he applied himself to the study of history and politics. In 1583 he was made gentleman usher to Queen Elizabeth, and in 1585 married Anne, daughter of Mr. Carew, of Bristol, and widow of Mr. Ball, a lady, as Wood informs us, of considerable fortune. Soon after he was employed by Queen Elizabeth in several embassies to Frederic King of Denmark, Julius Duke of Brunswick, William Landgrave, of Hesse, and other German princes, to engage them to join their forces with those of the English for the assistance of the King of Navarre, afterwards Henry IV. of France; and having discharged that commission, he was sent to King Henry III., at the time when that prince was forced by the Duke of Guise to quit Paris. This commission, he himself tells us, he performed with extraordinary secrecy, not being accompanied by even one servant (for so he was commanded), nor with any other letters than such as were written with the queen's own

hand to the king, and some select persons about him. "The effect," he continues, "of that message it is fit I should conceal; but it tended greatly to the advantage of all the Protestants in France, and to the duke's apparent overthrow, which followed soon upon it." In 1588 Mr. Bodley was sent to the Hague to manage the queen's affairs in the United Provinces, where, according to an agreement between the queen and the States, he was admitted one of the council of state, and took his place next to Count Meurice, giving his vote in every proposition made to that assembly. In this station he behaved greatly to the satisfaction of his royal mistress and the advancement of the public service. A more particular account of his negotiations with the States may be seen in Camden's *Annals of Queen Elizabeth*, under the year 1595, and in a short piece written by Mr. Bodley himself, and published by Hearne in his notes upon that passage of Camden entitled, *An Account of an Agreement between Queen Elizabeth and the United Provinces, wherein she supported them, and they stood not to their Agreement*. After nearly five years' residence in Holland, Mr. Bodley obtained leave to return into England to look after his private affairs, but was shortly afterwards remanded back to the Hague. About a year afterwards he came into England again, to communicate some private discoveries to the queen, and presently returned to the States for the execution of those counsels which he had secretly proposed. At length, having succeeded in all his negotiations, he obtained his final recall in 1597. After his return, finding his advancement at court obstructed by the jealousies and intrigues of the great men, he retired from it and from all public business, and never could be prevailed with to return, or to accept any new employment. In the account of his own life he has minutely detailed the particulars of the rivalry between the Earl of Essex and the Cecils, which caused his disappointment. In the same year he set about the noble work of restoring, or rather founding anew, the public library at Oxford, which was completed in 1599. After King James's accession to the throne, Sir Thomas Bodley received the honour of knighthood. He died the 28th of January, 1612, and was buried with great solemnity at the upper end of Merton College choir. Sir Thomas Bodley wrote his own life in the year 1609, which, together with the first draught of his statutes for his library, and a collection of his letters, were published from the originals in the Bodleian by Thomas Hearne, under the title of *Reliquiae Bodleianæ; or, Some Genuine Remains of*

Sir Thomas Bodley, 8vo, London, 1703. The life alone had been previously published in 4to, Oxford, 1647. (See the *Reliquiae Bodleianæ*; *Biographia Britannica*, Kippis's edition, vol. ii. p. 388–393; Chalmers's *Biographical Dictionary*, vol. v. p. 468, 484.)

Materials exist for an extended life of Sir Thomas Bodley in his public capacity in several of our libraries, more especially in the Cottonian and Harleian collections of manuscripts in the British Museum, and among the Bacon papers in the Archiepiscopal Library at Lambeth. Sir Thomas Bodley's original draft for the statutes of his library will be found in the *Reliquiae Bodleianæ*. The most interesting passage connected with Exeter in Macray's *Annals of the Bodleian Library* is the following:—

“The year 1602 was specially marked by the gift from the Dean and Chapter of Exeter to their fellow-countryman Bodley of 81 Latin manuscripts from their Chapter Library. By what right they thus alienated their corporate property no one probably cared to inquire; but from the tokens of neglect still visible upon the books, we may conclude that only by this alienation were they in all likelihood saved from ultimate destruction; for they nearly all bear the sign of having been exposed to great damp, which in several instances has well-nigh destroyed the initial and final leaves. Most of them are beautiful specimens of early penmanship, ranging from the eleventh century to the thirteenth, and amongst them is that precious relic of English Church Offices, the Service-book given to Exeter Cathedral by Bishop Leofric, in the reign of Edward the Confessor, described in the Register Beneficiorum simply as *Missale Antiquissimum*. This is happily perfect,—in size a small and thick quarto volume, written on very stout vellum, and containing 377 leaves. Four other volumes (possibly more) were also gifts of Leofric to his church. They are now numbered Auc. D. ii. 16 (the four gospels), Auc. F. 115 (Boethius and Persius), Auc. F. iii. 6 (Prudentius), and Bodley MS. 708 (Gregory's *Pastoral*). They each contain an inscription in Latin and Anglo-Saxon, varying in expression, but all to the following effect (as in the last-mentioned volume): “*Hunc libuem dat Leofricus Episcopus Sancti Petri Apostoli in Exonia ad sedem suam Episcopalem pro remedio Animæ sue ad utilitatem successorum suorum. Siquis autem illum inde abstulerit, perpetuae malesictione subjaceat.*” Then follows an Anglo-Saxon inscription to the same effect. To the MS. of the gospels are prefixed very curious lists in Anglo-Saxon of the lands, vest-

ments, books, &c., given by Leofric to his church, and of relics given by King Athelstan (of which another copy is preserved in the Missal). These lists are printed in the *Monasticon*, and the titles of the books are given in Wanley's *Catalogue*, p. 80.

The Bodleian, or Bodleian Library, the Public Library of the University of Oxford, was founded by Sir Thomas Bodley in 1597, the very year in which he retired altogether from public employment.

The first public library in Oxford was established in what was then called Durham (since Trinity) College, by Richard de Bray, or Aungerville, bishop of Durham and lord treasurer of England in the time of Edward III. He died in 1345, and left his books to the students of Durham College, who preserved them in chests until the time that Thomas de Hatfield, his successor in the see of Durham, built the library in 1370. Chalmers, however, in his *History of the Colleges, Halls, and Public Buildings of Oxford*, vol. ii. p. 458, says it is not very clear whether this was a public library in the usual meaning of the term, or one restricted to the use of the monks of Durham College only.

The next we read of was called Cobham's Library, which would have been the first, if Thomas Cobham, bishop of Worcester, had lived to have executed his own purpose. About the year 1320 he began to make some preparations for a library over the old Congregation-house in the North Churchyard of St. Mary's; but dying soon after, little progress was made in the work till 1367, when his books were deposited in it, and the scholars permitted to consult them on certain conditions. But the property of the site being contended between the university and Oriel College, the dispute was not finally determined till 1409, when the room was fitted up with desks, windows, &c., by the benefactions of King Henry IV.; of his four sons, Henry, Thomas, John, and Humphrey; of Thomas Arundel, archbishop of Canterbury; Philip Repindon, bishop of Lincoln; Edmund, Earl of March; and Richard Courtney, chancellor of the university, in whose time it was completed, about the year 1411. This appears to have been the first public library, and continued in use until 1480, when the books were added to Duke Humphrey's collection, for the reception of which a library-room had been completed.

Humphrey, surnamed the Good Duke of Gloucester, a man superior to the age in which he lived, was the real founder of the library; which was afterwards restored and re-founded by Sir Thomas Bodley. The number of books given by Duke

Humphrey is variously represented. Wood (*History and Antiquity of the University of Oxford*, vol. ii. part ii., 4to, Oxf., 1796, p. 715) says the different treatises amounted to six hundred : one only specimen at present remains—a manuscript in folio of Valerius Maximus, enriched with the most elegant decorations, and written in Duke Humphrey's age, evidently with the design of being placed in his sumptuous collection. The rest of the books, which, like this, being highly ornamented, and looking like missals, were supposed to convey ideas of Popish superstition, were destroyed or removed by the visitors of the university in the time of Edward VI., whose zeal was equalled only by their ignorance. A manuscript commentary on Genesis, by John Capgrave, belonging to Duke Humphrey's library, is still preserved in that of Oriel College, Oxford ; and one, if not more manuscripts, formerly belonging to the collection, are in the British Museum. Most of them, at the end, had usually this inscription, written in the Duke's own hand : "C'est livre est a moy Humfrey Duc de Gloucestre." Before the year 1555 the Duke of Gloucester's Library was totally despoiled of its contents, and the desks and benches ordered to be sold. The room continued empty until restored by Sir Thomas Bodley.

It was in 1597 that, as Camden justly observes, Sir Thomas Bodley set himself a task which would have suited the character of a crowned head—the restoration of the Public Library. With this view he sent a letter from London to the vice-chancellor, Dr. Ravis, dean of Christ Church, offering to restore the building, and settle a fund for the purchase of books, as well as the maintenance of proper officers. This offer being gladly accepted, he commenced his undertaking by presenting a large collection of books, purchased on the Continent, and valued at £10,000. Other collections and contributions were sent in, by his example and persuasions, from various noblemen, clergymen, and others, to such an amount, that the old building was no longer sufficient to contain them. He then proposed to enlarge the building ; and the first stone of the new foundation was laid with great solemnity, July 17th, 1610, and so amply promoted by his liberality, as well as by the benefactions of many eminent persons, that the University was enabled to add three other sides, forming the quadrangle, and rooms for the schools, &c. He did not, however, live to see the whole completed, as the time of his death, already recorded, will explain.

When Sir Thomas Bodley had succeeded in enriching his collection, probably far beyond his expectation, he drew up a

body of statutes, which have been since incorporated with those of the university. According to them the librarian is to be a graduate, unmarried, and without cure of souls, &c., and to be allowed deputies or assistants. One or two points in these regulations have been since altered:—the librarian is allowed to marry, and he can hold parochial preferment with his librarianship. The revenues for the maintenance of the library are intrusted to the vice-chancellor and proctors for the time being; and the vice-chancellor and proctors, the three professors of divinity, law, and physic, and the two regius professors of Greek and Hebrew, are appointed visitors.

The first catalogue of the printed books of the Bodleian was published in 4to in 1605, by Dr. Thomas James, Sir Thomas Bodley's first librarian. It was dedicated to Henry, Prince of Wales; and the books were classed in four faculties—divinity, medicine, jurisprudence, and arts—completed by an index of authors' names. A most extensive catalogue, in an alphabetical form, was published by Dr. James in 4to, Oxford, 1625; and another catalogue, which had been compiled by him, of works in the Bodleian, printed and manuscript, in interpretation of the Scriptures, was printed in a thin 4to at Oxford in 1635. “A Nomenclator of such Tracts and Sermons as have been printed or translated into English upon any plan or books of Holy Scripture, now to be had in the most famous library of Sir Thomas Bodley in Oxford,” was also printed in 18mo, in 1642, by John Veneuil.

In 1674 a new catalogue of the printed books of the Bodleian was published in a folio volume, under the care of Dr. Thomas Hyde; and another of the manuscripts, distinguishing the different collections, was inserted in the general *Catalogue of the Manuscripts of England*, folio, 1697. A still more extensive catalogue of the printed books was published in two volumes, in folio, in 1738, which was thought so sufficiently perfect in its day, that almost every college library in the university had a copy interleaved to mark off the books in the catalogue which they themselves possessed, and to insert additions. This is the last general catalogue which has been published of the books in the Bodleian Library; but from the immense increase of the collection, it has become but of little use. Another was undertaken a few years ago, and had proceeded, under the direction of the then librarian [1836], Dr. Bandinel, to some extent in the printing; but we are informed that the publication has been since abandoned.

A few catalogues of particular portions of the Bodleian

collections have been published at different times. Dr. Uri printed the first part of a catalogue of the Oriental manuscripts, in folio, in 1787, which was continued in 1821 in a catalogue of the Arabic manuscripts, prepared by Mr., afterwards Dr., Alexander Nicol. After the acquisitions made at the Pinelli and some other sales, a small octavo volume, entitled "Notitia Editiorum quoad libros Hebr., Gr., et Lat., quæ vel primariae, vel Sæc. xv., impressæ, vel' Aldinæ, in Bibliotheca Bodleiana adservantur," was published in 1795. Another catalogue, entitled "Codices Manuscripti et Impressi, cum Notis Manuscriptis, olim D'Orvilliani, qui in Bibliotheca Bodleiana adservantur," was printed by Mr. Gaisford, since dean of Christ Church, in 4to, 1806; and the first part of another catalogue of the manuscripts collected in the East by Dr. E. D. Clarke, and purchased from him for the Bodleian, was published also by Mr. Gaisford, in 4to, 1812, followed by a second part in 1815, containing the Oriental MSS., edited by Mr. Nicol. In 1814 a catalogue of the books relating to British (including Welsh, Scottish, and Irish) topography, and Saxon and Northern literature, bequeathed by Richard Gough, Esq., was printed at the Clarendon Press by Dr. Bandinel. The curators of the Bodleian have for many years published, or rather printed and distributed, and continue to print and distribute, annual alphabetical catalogues of its acquisitions in the department of printed books, for the information of the university.

A catalogue of the coins in the cabinet of the Bodleian was published by Mr. Francis Wise in 1750, in folio, illustrated by numerous plates, under the title of "Catalogus Nummorum Antiquorum in Seriniis Bodleianis ruconditorum, cum Commentario."

An annual speech in praise of Sir Thomas Bodley was founded in 1631, by Dr. John Morris, canon of Christ Church, and confirmed by the vice-chancellor. These speeches are delivered at the visitation day of the library, November 8th.

It would require a volume to enumerate the many important additions in books and manuscripts made to this library by its numerous benefactors, or to give even a superficial sketch of its ample contents in every branch of science and learning. Among the earliest benefactors were Robert Devereux Earl of Essex, Thomas Sackville, Lord Buckhurst, and Earl of Dorset, Robert Sidney, Lord Sidney of Penshurst, Viscount Lisle, and Earl of Leicester, George Carey, Lord Hunsdon, William Gent, Esq., Anthony Browne, Viscount Montacute, John Lord Lumley, Philip Scudamore, of London,

Esq., and Lawrence Bodley, younger brother to the founder. The contributions of all these persons were made before the year 1600.

In 1601 collections of books and manuscripts were presented by Thomas Allen, sometime fellow of Trinity College, Thomas James, the first librarian, Herbert Westphaling, bishop of Hereford, Sir John Fortescue, knight, Alexander Nowell, dean of St. Paul's, John Crooke, recorder of London, and chief justice of the common pleas, and Nicholas Bond, D.D., president of Magdalen College.

The most extensive and important collections, however, are those of the Earl of Pembroke, the celebrated Mr. John Selden, Archbishop Laud, Sir Thomas Roe, Sir Kenelm Digby, General Fairfax, Dr. Marshall, Dr. Barlow, bishop of Lincoln, Dr. Richard Rawlinson, Mr. St. Arnaud, Bishop Tanner, Browne Willis, Thomas Hearne, Mr. Nathaniel Crynes, and Mr. Godwin. The library bequeathed by Richard Gough, Esq., which came to the Bodleian in 1812 (the catalogue of which has been already noticed), is perhaps the most perfect series of English topographical works ever formed, and is particularly rich in topographical manuscripts, prints, drawings, and books illustrated by the manuscript notes of eminent antiquaries. The last collection of great importance bequeathed to the Bodleian have been those of Edmond Malone, Esq., in 1812, and of Francis Douce, Esq., in 1834.

The Bodleian Library was first opened to the public on Nov. 8th, 1602, and by the charter of mortmain obtained of King James, Sir Thomas, then lately knighted by him, was declared founder; and in 1605 Lord Buckhurst, Earl of Dorset, and Chancellor of the University, placed the bust of Sir Thomas in the library. Since the year 1780 a fund of more than £400 a year has been established for the purchase of books. This arises from a small addition to the matriculation fees, and a moderate contribution annually from such members of the university as are admitted to the use of the library, or on their taking their first degrees; to which is to be added the privilege claimed as a matter of right under the Copyright Act of a copy of every book printed in Great Britain and Ireland.

The principal librarians since the foundation by Sir Thomas Bodley have been—1. Thomas James, fellow of New College, 1593; 2. John Rouse, fellow of Oriel, 1620; 3. Thomas Barlow, fellow, afterwards provost, of Queen's, Bishop of Lincoln, 1653; 4. Thomas Lockey, student, and afterwards canon of Ch. Ch., 1660; 5. Thomas Hyde, of Queen's Col-

lege, afterwards Laudian professor of Arabic, regius professor of Hebrew, and canon of Christ Church, 1665 ; 6. John Hudson, of Queen's, afterwards principal of S. Mary Hall, 1701 ; 7. Joseph Bowler, fellow of Oriel, 1719 ; 8. Robert Fysher, fellow of Oriel, 1729 ; 9. Humphrey Owen, fellow, and afterwards the principal, of Jesus College, 1747 ; 10. John Price, B.D., of Jesus College, afterwards of Trinity, 1768 ; 11. Bulkeley Bandinel, D.D., late fellow of New College, 1813, the librarian in 1836.

All members of the university who have taken a degree are admitted to study in the library : no books have ever been suffered to be taken from it. Literary persons, either native or foreign, are also allowed, on being properly recommended, to read and take extracts from the books in this collection. By the provisions of a statute promulgated and confirmed in full convocation, December 2, 1813, the officers of the library were increased to a principal librarian, two under-librarians, with the degrees of M.A. or B.C.L. at least, and two assistants, either B.A. or under-graduates. The library is open, between Lady Day and Michaelmas, from nine in the morning till four in the afternoon ; and during the other half-year from ten till three. It is closed on Sundays and State holidays ; from Christmas-Eve to the 1st of January inclusively ; on the feast of the Epiphany ; from Good Friday to Easter Tuesday inclusively ; on the days of Encænia and commemoration ; seven days immediately following the 1st of September, and eight days preceding the visitation of the library. On all other holidays it is opened immediately after the university sermon. (See the *Reliquiæ Bodleianæ*, 8vo, London, 1703 ; Wood's Account of Bodley's Library, Hist. and Antiq. of the University of Oxford, 4to, 1796, vol. ii. part ii. p. 920-953 ; Chalmers's History of the Colleges, Halls, and Public Buildings attached to the University of Oxford, vol. ii. p. 458-464 ; Oxford University and City Guide, 8vo ; and the Oxford University Calendar for 1835.)

I cannot but refer in passing to Mr. Rounstan's *Memories of the British Museum* just published, in which he says that Sir Robert Saville, when Sir Thomas Bodley was about to visit Sir Robert Cotton, was warned that "if he held any book so dear as that he would be loath to lose it, he should not let Sir Thomas out of his sight, but set the book aside beforehand." I suspect this was a hit at Sir Thomas's desire to acquire any Bibliographical treasure, than an accusation of kleptomania against the Exeter knight.

In the biography of Exonians (Oliver) the following notice appears.

BODLEY (Sir Thomas). This illustrious patron of letters was the eldest son of *Mr. John Bodley*, by his wife *Joan Hone*, and was born in this city, 2nd of March, 1544.* His education was begun at Geneva, continued at Magdalen College, and finished at Merton College, Oxford. Travelling afterwards on the Continent for improvement, and employed by his sovereign, Queen Elizabeth, in diplomatic missions, he had many opportunities of comparing the flourishing state of the public libraries abroad, with the neglected and degraded condition of the library belonging to his "reverend mother, the University of Oxford."† A well educated scholar himself, commanding an easy fortune, possessing an extensive acquaintance with eminent characters in church and state, and enjoying a considerable degree of dignified leisure, he turned all his attention to remedy this deplorable evil and national misfortune, or, to use his own words, to "reduce that place which in every part lay ruined and waste to the public use of students." With this view he directed a letter (dated London, February 23rd, 1597) to Dr. Ravis, vice-chancellor of the university of Oxford, explanatory of his desire to re-found and endow a public library. The letter may be seen p. 308, lib. i., of Wood's *History and Antiquities of the*

* Several of the Bodley family resided in St. Petrock parish, as we learn from the Indented Roll of Registers, begun 5th January, 1539. John Bodley, son of John Bodley, was baptized 13th January, 1551. Arthur Bodley, 19th February, 1554. Robert Bodley, 8th November, 1559. Dunscombe, in Crediton parish, was the cradle of the family.

† Of the havoc made in the Augervillian and Cobham Libraries there, during the reign of Edward VI., Mr. Chamberlain (*Present State of England*, part iii. p. 550) complains thus: "Those visitors, under pretence of rooting out popery, superstition, and idolatry, utterly destroyed these two noble libraries, and embezzled, sold, burnt, or tore in pieces, all those valuable books, which those great patrons of learning had been so diligent in procuring in every country of Europe. Nay, their fury was so successful as to Augervillian Library, which was the oldest, largest, and choicest, that we have not so much as a catalogue of the books left. Nor did they rest here; they visited likewise the college libraries; and one may guess at the work they made with them, by a letter still kept in the archives, where one of them boasts that *New Collige quadrangle was all covered with the leaves of their torn books*. The university thought fit to complain to the government of the barbarity and covetousness of the visitors, but could not get any more by it than *one single book*, given to the library by John Whethamstead, the learned abbot of St. Albans, wherein is contained part of *Valerius Maximus*, with the commentaries of *Dionysius de Bergo*. And to this day there is no book in the Bodleian Library besides this and two more which are certainly known to have belonged to the former libraries. Nay, and the university itself, desparing ever to enjoy any other public library, thought it desirable to dispose of the very desks and shelves the books stood upon, in the year 1555." See also pp. 49, 50, lib. 77, *History et Antiquities University Oxon.*

University Oxford. It was read in full convocation, and the offer gratefully accepted. Instantly his treasures of manuscripts and books, collected with so much care and expense, began to pour in. Many illustrious individuals and societies caught his noble spirit; and to their eternal glory be it said, the Dean and Chapter of Exeter sent thither, in 1602, one hundred and thirty two manuscripts! "Anno 1602, Decanus et Canonici Exonienses donarunt CXXXII., tractatus MSS." p. 51, lib. lxxvii., *History and Antiquities University Oxon.* A larger edifice was now required, and its foundation stone was laid on the 19th of July, 1610, with becoming solemnity. The patriotic founder did not live to see it completed; but left £200 per annum for its support, with a body of statutes for its care and government. He died 28th January, 1612, æt. 67, at his house, in the parish of St. Bartholomew the Less, London; and his body was interred on the 29th March following, in the chapel of Merton College, with royal magnificence. At the yearly visitation the grateful university pronounces an oration in his praise; indeed, every friend of literature, whatever may be his religion, country, or political bias, must feel indebted to this signal benefactor of the republic of letters. Exeter may well be proud of having given birth to *Sir Thomas Bodley*; and we cherish the hope that his spirit will revive in his native city; that some highly gifted individual will emulate this illustrious patriot, and endow a public library for the use of its inhabitants. Such a foundation would be met with corresponding encouragement. Learning is the food of the mind; and a good public library is one of the best ornaments of a town, and the most rational resource of free-born men.

The worthy knight's brother, Laurence Bodley, D.D., was a canon of Exeter Cathedral, and the rector of Shobrooke, and vied with him in charity and munificence. He died 19th April, 1615, and was buried, as we learn from the register of this Cathedral, on the 9th of May. By his will, dated April 12th, 1615, and proved in the Prerogative Court of Canterbury, on the 3rd of the following June, he bequeathed £400 to the mayor and corporation of Exeter, to provide a preacher for this city, with a salary of £20 per annum.*

* In a letter of John Periam (the Rev. Doctor's cousin) to the mayor, Thomas Walker, Esq., dated 28th August, 1615, he says that though the Doctor's will allowed but £20, yet that the preacher's salary would be made up £40 by the contributions of the well disposed. The mayor and corporation, in a letter to Bishop Cotton, November, 1615, signify that the Rev. John Hazard is "willing to undertake the lecture for £20, according to the will,"

Two other brothers, *John* and *Zachary*, were clergymen. The youngest and fifth, Sir Josiah Bodley, was a gallant soldier, and distinguished himself in the Netherlands and Ireland. Dying 19th August, 1617, he was buried in Christ Church, Dublin.

having other livings among us in right of his wife, where he is desirous to live rather than elsewhere." N B.—The mayor and chamber, receiving another donation from Thomas Mogridge of £200, purchased, 8th April, 1631, the great tithes of Hennock, for the maintenance of the said lecture.

ON AURORA BOREALIS.

BY THE REV. R. KIRWAN, M.A., F.S.A., RECTOR OF GITTISHAM.

(Read at Exeter, July, 1872.)

A MAGNETISED needle freely suspended always directs itself towards the polar regions of the earth. The absolute direction of the compass varies with time and place, according to laws which are complicated, and are but little understood; there is a general movement which carries the needle gradually from year to year towards the east or towards the west; there is a diurnal variation of very sensible amount, according to which the horizontal needle makes each day two complete oscillations, producing two *maxima* and two *minima* in the course of the twenty-four hours.

There is also, in addition, an irregular variation produced by the aurora borealis, and this occurs even when the aurora is so far distant as to be beneath the horizon of the particular locality in which the oscillating needle is situate. The mere inspection of a magnetised needle will suffice to show that there is occurring in some portion of our atmosphere a phenomenon as well worthy the investigation of the most learned physicist, as it is of the wonder of the most unlettered spectator.

This was the case with the Aurora of February 4th, 1872. Through the early part of the day the needle had presented nothing remarkable; it followed its regular course of diurnal variation until about two o'clock p.m., when its abnormal vibrations became perceptible, and the three principal exponents of the earth's magnetic power were visibly disturbed. As a consequence of this derangement of the equilibrium in the distribution of magnetism, the telegraph system throughout the greater part of the world became interrupted. Under the influence of the great magnetic storm that was about to be rendered visible as it flashed in beams of coloured light across the heavens, the needle vibrated through an arc of 20°, whilst the disturbance manifested itself simultaneously at

several different telegraphic centres that were separated one from another by thousands of miles of sea and land.

After a continuous fall of rain, which lasted from morning until sunset, a rose-coloured glow of light became visible in the western horizon; it appeared to be brighter than twilight could be at that hour, and resembled the reflection of an extensive distant conflagration; at the same time some cirro-stratus clouds low down in the same quarter of the heavens were visibly tinged with red. In the north-western horizon was a long, low, dark segment of cloud, through which a star was shining; the colour of it gradually changed to a dull brown, as if thick smoke was obscuring the sky; partially encircling the dark segment was a faintly luminous arch, the vertex of which rose to an altitude of about 25° above the horizon. Meanwhile in the south and east the display rapidly increased in brilliancy. Shortly after six o'clock long streamers of white and greenish-white light embraced the celestial vault like an ill-defined arch, descending to the east on the one side, and to the west on the other, with the Pleiades as a centre. Gradually the fringe, or border, of the arch became more regular as it rose towards the zenith; at the same time it flashed and re-kindled in ever-varying coruscations as the brightness of each beam successively increased in brilliancy, and as it alternated from the faint light of the Milky Way to the luminosity of a white cloud behind which the full moon is imperfectly concealed. Beneath this large arch of silvery whiteness there appeared an arch of vivid rose-colour, the extremities of which terminated at the same two points of the horizon as did the white arch. This lower arch, faint at first, attained more intensity in proportion as the upper arch grew dim; its two arms then presented a perfectly regular appearance like ribbons of equal width, the colours of which gradually diminished in brightness towards the edges.

About 6.45 p.m. the phenomenon attained its greatest brilliancy. The dark segment appeared to be enlarged until it occupied a third portion of the horizon towards the north and north-west; from its luminous edge there shot forth in all directions brilliant rays, red in colour, and of different degrees of intensity; they appeared to converge towards a point in the heavens indicated by the dipping-needle; at times they quite reached this point, and uniting there formed a sort of wheel, the so-called corona borealis.

The most brilliant rays were directed towards the south-east, whilst others, less bright but of greater length, shot

forth towards the south-west and reached down to the horizon; others again, less in brilliancy and in length, shot forth radially in other directions, and so completed the wheel. During the whole duration of this phenomenon, but more particularly between 6.30 and 7 o'clock, flocculent luminous bands of a white colour, often assuming a greenish tinge, appeared in the east and south-east, and darted rapidly towards the west. Frequently it happened that whilst these luminous clouds were forming in one quarter of the horizon, they appeared simultaneously upon the other, and rushing together, formed an immense white luminous sheet or band, which continually changed its character, and disappeared as rapidly as it formed. At one time rose-coloured and red streamers, intermingled with orange-coloured bands and phosphorescent rays of green and bluish-white light, shot forth from the south in such numbers that their incessant fluctuations defied accurate description.

It is said that every observer sees a separate rainbow. Humboldt adds that this is also true of the aurora. About 7.35 a ray of silvery whiteness formed rapidly upon the red vault of the heavens, and gradually extended itself to a length of about 15° from α *Orionis* to β of *Canis Major*. This ray closely resembled the tail of a comet which may be supposed to have had α *Orionis* as its nucleus. At the expiration of three or four minutes it gradually disappeared, and some moments later was replaced by three other luminous rays, which appeared to emerge from a point situated little to the south of α *Orionis*.

Later in the evening the chief display was towards the north and east. A reddish band, diffused at its edges, passed by Cassiopeia, the Pole-star, and the Great Bear. Lower down towards the horizon the sky at this time assumed a dull grey tint. Towards the south was a corresponding red band, but wider and more intense, especially towards the west.

Gradually the corona and the luminous arches broke up; a scattered luminous patch of a deep red continued to glow, which in turn became more and more indistinct, until about 9.50 o'clock they became confused with the clouds, and left nothing but a trace of the dark smoke-like segment on the horizon.

If we pass in review the phenomena thus presented to us, it will be observed that many of them were of an exceptional character. One of the most surprising peculiarities that marked this auroral display was the unusual brightness that it spread over the face of nature, a brightness that rivalled

that of the full moon when partially concealed by light, fleecy clouds. At eight o'clock, whilst walking in the garden, I could read the print of an ordinary book without difficulty.

Another peculiarity was that the phenomenon began in the south and south-west, and thence passed gradually to the north and north-east. Up to seven o'clock the coruscations were less distinct and less brightly coloured in the northern hemisphere than they were in the opposite, southern, hemisphere.

A third well-marked phenomenon, which is unusual though not without precedent, was the auroral arch, which spanned the heavens from north-east to south-west like a rainbow, and which lasted, almost without intermission, for a period of nearly two hours. The culminating point of this arch was apparently in the magnetic meridian, and its two points of intersection with the horizon were at equal angular distances. The arch continued to rise from the south-west and south-east towards the zenith, until it reached the magnetic north, where it remained almost stationary for nearly an hour. This immobility would imply that the phenomenon is atmospheric and not cosmical, because the diurnal rotation of the earth produced no effect upon its apparent position.

Another peculiarity was, that when the coruscations passed beyond the zenith, they united with beams coming from the opposite quarter of the sky, so as to produce the corona. It would seem as if there were originally two luminous *foci* or regions, which spread until they became united, and assumed a deeper crimson hue the more intimately they united together. The rays or streamers thus formed an immense circle, almost complete in outline, though less clearly defined towards the north, in which they appeared successively red, white, and greenish, though red was the prevailing colour, especially towards the zenith; sometimes they faded away, and a moment afterwards shot out again, and darted forth with increased brilliancy.

It may be noted also that the early hour (five o'clock) at which this auroral display was first seen implies that at its commencement it was a day aurora. Such a phenomenon is not unknown; it is characterised by the same features as those which distinguish the nocturnal aurora, with the exception that it is entirely pale and colourless. The stream of electric matter issues very perceptibly from a dark segment in the west; thence diffusing themselves, the rays converge towards the zenith, and diverge again towards every point of

the compass; the corona appears as a thin white canopy; the coruscations also are as instantaneous, and as distinctly perceptible by day as they are by night. The appearance gradually vanishes, giving place to thin scattered vapours and cirro-stratus clouds, which overspread the sky in detached masses.

Is the aurora accompanied by any sound? Strangely enough, this is a question of fact upon which observers are not in accord. I listened intently for the "crackling noise," the "rushing and brushing like silk," which has been said to accompany the appearance and flickering of the streamers, but in vain. Arago quotes several instances in which a rustling noise, easily distinguishable from the wind, is said to have accompanied the aurora when it appeared low down towards the horizon. He adds also an extract from the fifteenth volume of the *Swedish Transactions*, containing a report made to the Academy of Stockholm, by Dr. Gisler, and which is to the following effect:—"The matter of which the northern lights consists sometimes comes down so low as to touch the ground. On the summit of high mountains it affects the faces of travellers in a manner analogous to the wind. I have often (continues Dr. Gisler) heard the sound of auroras. It is a noise much resembling that of a strong breeze, or the brushing sound produced by some chemical substance when in the act of decomposition. I often thought I perceived the cloud to have a smell of smoke, or of burnt salt (ozone)." Curiously in accordance with this statement is that made by the aeronaut, M. Rollier, who descended in Norway forty hours after escaping from Paris in a balloon during the siege of December, 1871; his account is that he found himself upon Mount Lidde, thirteen hundred metres in height, in the middle of the brilliant rays of an aurora, with the accompaniment of a peculiar noise and an odour of sulphur that was almost suffocating.

On the other hand, Gmelin, Patrin, Parry, Franklin, and other Arctic navigators, both English and American, assure us that not the slightest noise was ever heard even when the phenomenon was most brilliant. It is impossible to reconcile such a conflict of testimony, except by supposing that the rustling sound which the mind naturally associates with a light body in rapid motion is an exceedingly rare phenomenon, observable only when the aurora is unusually low.

I took the opportunity when the auroral display of February 4th was at its maximum of intensity to examine the streamers through a small direct-vision spectroscope. In order to collect

sufficient light the slit was opened tolerably wide, and upon turning it towards the heavens some interesting features were brought out. Angström's characteristic auroral line in the yellow-green part of the spectrum (1474 K) was near the calcium group, and, which is not coincident with any known telluric element, many were visible even in those portions of the sky which to the eye were unilluminated; when the instrument was directed to those which were glowing with bright red, a red line appeared in the field of view near the atmospheric Fraunhofer line C; whilst again, when the coruscations assumed a blue or violet tint, a faint line or band near F was perceptible. This observation confirms the conclusion of Zöllner, that "the spectrum of the aurora borealis is not coincident with any of the known spectra of gases of our atmosphere, because it is the spectrum of an order that has not yet been artificially produced." By this remark of the German spectroscopist, I understand him to mean that whilst the light of the aurora is due to luminous vapour, and to the passage of electric discharges through that vapour, we can argue nothing from the relative position of the bright lines as to the nature of the gases through which the electric discharges occur, because the spectrum is altogether abnormal, and one with which no spectrum that is known to us presents any points of comparison. The same observer goes on to point out the difficulties that beset the comparative examination by the spectroscope of any two sources of light; the resulting spectra depend much upon conditions of temperature of pressure and of extent of the gaseous masses; the relative position also of the bright lines varies for the same gas under these different circumstances, so that no conclusion can be drawn with certainty from the comparison. Further, M. Vogel, relying upon a large number of observations made by spectrum analysis of auroras compared with atmospheric air, with nitrogen and with oxygen, has come to the conclusion that he has found in the light of these gases the greater part of the bright bands which Angström, Struve, Cornu, and Pragmowski have described as characteristic of the auroral spectrum. He did not, however, succeed in this when he notably diminished the intensity of the light, by means of a weakening of the electric discharges, in order to approach as nearly as possible to the conditions which occur in the light of the aurora. It was chiefly in the spectrum of nitrogen that he found the lines that characterise the spectrum of the aurora, and more particularly the yellowish green line already spoken of (K 1474). M. Respighi has remarked that this

same green band occurs also in the zodiacal light; whilst the American spectroscopists assert that the first three of the bright lines that occur in the auroral spectrum coincide exactly with the bright lines that cross the spectrum of the solar corona when observed upon the occasion of an eclipse of the sun. The results at present obtained are not entirely conclusive; but if subsequent observations confirm them, it would simply show that nitrogen is found as well in the solar atmosphere and in the zodiacal light as in our atmosphere—a fact that would be in no wise remarkable, for the well-known line of nitrogen occurs also in the spectrum of the nebulæ. Such observations are of value also as tending to show that the aurora is a terrestrial rather than a cosmical phenomenon, be the source of luminous electricity what it may.

One more point of importance amongst those which have been noticed upon the occasion of the auroral display of the 4th February deserves attentive examination, which is the relation that exists between the appearance of auroras and the presence of solar spots. M. Wolf, of Zurich, has demonstrated, by the analysis of a great number of observations, that the periodic return of auroras and of the associated phenomena of magnetic storms coincides with that of the maximum of spots upon the surface of the sun. M. Tacchini remarked upon the days that both preceded and followed the auroral display of February last the prevalence of solar spots, and a maximum on the very day of its appearance. Mr. Loonis has also noted the coincidence of the periodic return of the aurora with that of solar spots; and, basing his conclusions upon observations made during two cycles of eleven years, he points out that it is not the absolute number of auroras that varies year by year so much as their intensity. This explains the fact, that whilst the phenomenon is repeated with the same frequency every year in the polar regions, there are also periods in which it is not sufficiently intense to be observed in our latitudes. It is also upon the intensity of atmospheric electricity that the state of the solar surface would have the most powerful influence. This proves also that it is in the sun himself that we must search for the origin of this electricity. M. Buquerel has suggested that it is difficult to decide whether in the production of atmospheric electricity the action of the sun is direct or indirect. In either case, however, that action would be modified by the presence of a greater or a lesser number of spots. Be it observed also that the electrical theory of the aurora borealis

is entirely independent of this question ; it is founded on the considerations—points enunciated by de la Rive—that atmospheric electricity has its origin in the unequal distribution of temperature in the strata of the atmosphere ; that the lower column of the atmosphere is negative, whilst the upper column is positive, the intensity of which continues to increase with the height of the atmosphere. At the polar regions the positive electricity of the atmosphere combines readily with the negative there accumulated on the earth, whereby a current is formed which proceeds from south to north in the upper regions of the earth, and from north to south on the surface of the earth. The aurora borealis M. de la Rive considers to be the luminous effects of these currents travelling in these high regions towards the north pole, and thus explains the phenomena. Thus the aurora is not to be regarded as the cause of the magnetic perturbation, but as the result of a state of "electric activity" excited to the production of a luminous phenomenon—an activity which manifests itself on the one hand by the oscillations of the needle, and on the other by the appearance of a brilliant auroral light.

"That the aurora (says Humboldt) is a magnetic phenomenon has, by Faraday's brilliant discovery of the evolution of light by the action of magnetic forces, been raised from a mere conjecture to an experimental certainty." The fact which gives to the phenomenon its greatest importance is, that the earth becomes self-luminous ; that besides the light which as a planet it receives from the central body, it shows a capability of sustaining a luminous process proper to itself ; and this going on almost uninterruptedly in the polar regions leads us by analogy to the remarkable phenomenon presented by Venus, when the portion of that planet not illuminated by the sun is seen to shine with a phosphorescent light of its own.

In the present state of our knowledge, we are unable to explain all the phenomena associated with an auroral display ; but science is essentially aggressive, and by the careful observation of future auroras fresh data will be collected, whereby she will either confirm the theories already received, or else will suggest new ones in their stead.

THE FAUNA OF DEVON.

PART VIII.

ECHINODERMATA.

BY E. PARFITT.

(Read at Exeter, July, 1872.)

WHEN Werner propounded his theory of the earth, he was led to believe, from the regularly superimposed strata which he observed in the district examined by him, that the regular layers, or strata, had been precipitated from a universal menstruum, which is supposed to have once covered our planet. Werner consequently applied this theory to the whole world. But it will be seen, on the slightest examination, that this could not be the case; for if we can suppose a universal menstruum at all, we must suppose it to be in all degrees the same, and therefore of one homogeneous mass, whereas our sedimentary rocks to which Werner referred are in most respects composed of very different materials, and in most instances the strata are very well defined. This universal menstruum has, since Werner's time, been differently explained, but the changes which the materials forming our globe must have undergone since this was first launched into space we can now scarcely comprehend; but if once these materials formed one homogeneous mass, how great is the change they must have undergone: the sifting and segregation to form our various and generally distinct formations, is something that will not at present admit of explanation.

But, notwithstanding, Werner's theory contained in its germs which have sprung into great results; for it sounded the key-note of the order of things, to which the greater part of the earth's crust has been reduced by further investigation. But not to that regularly and evenly-arranged crust that it was at first supposed, that the strata superimposed upon each other like the coats of an onion. If this had been the

case, the study of geology would be reduced to the meanest comprehension.

Mr. Herbert Spencer says that it is "only the last chapter of the earth's history that has come down to us. The many previous chapters, stretching back to a time immeasurably remote, have been burnt, and with them all the records of life, we may presume, they contained. The greater part of the evidence which might have served to settle the development-controversy is for ever lost; and on neither side can the arguments derived from geology be conclusive."* But, notwithstanding this assertion, we are enabled to gain a large insight into the floras and faunas that have passed away through the materials which have been spared to us, "The Medals of Creation," as Dr. Mantell very happily termed them.

It is to a certain group of animals which have been, I may say, wonderfully preserved that the present paper is devoted; for during the formation of the silurian and carboniferous rocks the Crinoids, or sea-lilies, were very abundant, and must have formed a peculiar feature in the faunas of those periods. "So numerous are the remains of their skeletons, that they constitute great tracts of dry land as it now appears. For miles and miles we may walk over the stony fragments of the Crinoidæ."† These animals appear to have reached their culminating point during the formation of the mountain limestone; from this they declined in numbers, but did not die out, for in the Lias we find one of the most perfect and remarkable forms—*Pentacrinus briareus*, which, when alive and entire, must have had a certain resemblance to the New Zealand tree ferns, only that this lived on the muddy bottom of the sea, instead of the damp shady forest.

This genus is still living in the seas around the West India Islands; a form which resembles *P. briareus* very much; so much, indeed, that it might almost be taken for a slightly modified form of the Liasic species. This is the *Pentacrinus Caput-Medusæ*. This species has been known to naturalists for a long time; but this year Professor Agassiz and his band of scientific investigators in the U.S.S.S. Haslar have added several new species of Crinoids from the seas around the Island of Barbadoes. But these appear like the fag-end of a numerous family; they have degenerated in size, and are exceedingly rare, as compared with the early history of this family; they seem almost to have reached the end of their existence.

* "Essays Scientific," &c. Second series.

† Forbes's "British Star-fishes."

We have living in our own seas and bays one of the Crinoid family—the Rosy-feather Star-fish; it is one of the most interesting and beautiful species now living. And anatomically it is one of the most instructive, as it is the connecting link between the true Star-fishes and the Crinoidæ. Mr. Miller of Bristol, the author of a work on the fossil Crinoidæ, was the first, I believe, to point out the true homology of this species with the Crinoids. But Mr. J. V. Thompson was the fortunate discoverer of the pedicellated character of the young animal.

The peculiarity of this species is that it is a Crinoid attached to a jointed stem in its young state; and in after life, or when it has arrived at a certain stage, it quits the stem, never more to return; it is then termed a star-fish. It is at this time a free pelagic animal. The Rev. T. Hincks, F.R.S., has met with this species in some numbers in Salcombe Bay in its pedicellated condition, and I have taken it in the tide pools at Exmouth.

Since the discovery of this species in its pedicellated form by Mr. Thompson in the Irish sea, Professor Wyville Thomson and Dr. Carpenter have given us its whole history in two splendidly illustrated monographs in the *Royal Society's Transactions*. To compensate this creature for the loss of its stem, it is provided with a set of prehensile arms, so that it can lay hold of any object, and remain. All the star-fishes, and the Rosy-feather Star included, are hermaphrodite animals, and the fertilization and development of the larvæ from the egg is very rapid; the process occupies from 12 to 24 hours only before the emersion of the embryo, and in a few hours more the embryo changes from a spherical to a sub-pyramidal form, having a flattened base. From this point of its history various modifications take place; but at present no signs of the form of animal it will ultimately attain show itself.

At length, however, this pluteus, as it is termed, begins to show signs of the group of animals to which it belongs. A thin, delicate, calcareous concave plate is formed over the mouth, on which is seen to develope tubercles, which afterwards grow into tubular cirri. Here, then, we see the first signs of a pentamerous animal. From this stage there is a gradual development of calcareous plates in the intervening spaces between the cirri. The cirri at this time also shows signs of the ultimate ambulacral feet of the fully developed animal.

But in all these additions and various phases the "embryo appropriates no part of the larva except the stomach and

some of the formative blastema which is aggregated round it.* At this time there appear on the disc two *pedicellaria*, which exhibit spontaneous motion, the arm of the pincers opening and shutting."†

These pedicellaria have been a great puzzle to naturalists as to their office in the economy of the animals on which they are found. They are exceedingly abundant on the Echinidæ and the Star-fishes, as well as on some of the Bryozoa. They were looked upon as parasites for a long time; and those on the Bryozoa were regarded as a sort of policemen, as they have been seen to seize minute annelids which ventured over the surface of the Zoophyte. We have to thank Professor Agassiz for the discovery of their utility as relating to the sea-urchins. He says, "If we watch a sea-urchin after it has been feeding, we shall learn at least one of the offices which this singular organ performs in the general economy of the animal. That part of the food which he ejects passes out at an opening on the summit of the body, in the small area where all the zones converge. The ejected particle is received on one of these little forks, which closes upon it like a forceps, and it is passed on from one to the other down the side of the body till it is dropped off into the water.

"Nothing is more curious and interesting than to watch the neatness and accuracy with which this process is performed. One may see the ejected bits of food passing rapidly along the lines upon which these pedicellaria occur in the greatest number, as if they were so many little roads for carrying away the refuse matters; nor do the little forks cease from their labours till the surface of the animal is completely clean and free from any foreign substance."

The pedicellaria vary in form on the different species of Echini, so that they might be used in the specific diagnosis of the animals on which they are found.

In the young state of the Rosy-feather Star, the arms or rays are forked or divided at the base the same as the true Crinoids—a character which dates very far back in time, and one which seems to point to a common origin. In the *Geological Magazine*, vol. vi. 1869, Mr. H. Woodward has figured and described a beautiful fossil, *Eucladia Johnstoni*, from the Upper Silurian of Dudley.

This species is further removed from the Crinoids than the Rosy-feather Star, as it belongs to the Ophiuridæ, and in this the arms are divided in a very remarkable manner from the very base. Mr. Woodward says, we have in this fossil pre-

* Prof. Rolleston.

† Prof. Owen.

sented to us a type of Palæozoic star-fishes extending its affinities towards the *Comatulæ* (*Antedon*) on the one hand, and the *Ophiuriæ* and *Euryales* on the other; exemplifying what Professor Owen has so happily termed "a more generalised type of structure" than at present existing in the class *Echinodermata*; and "as we advance in our survey of the organisation and metamorphosis of animals, we shall meet with many examples in which the embroznic forms and conditions of structure of existing species have at former periods been persistent and common, and represented by mature and procreative species."*

All those who have visited the sea-shore must have observed one or two species of star-fishes that have been left by the receding tide. Some of these specimens will be seen to have five rays or arms; others only four, three, or two, as the case may be; the normal number being five in our common species. These creatures are exceedingly tenacious of life, and will bear almost any amount of mutilation before they are deprived of life. Specimens are frequently found with one, two, or three rays entire, and the rest wanting, or with very short ones, sometimes only just budding, or in various stages of growth.

These animals, then, have the power of reproducing an arm in the place of the lost one; and so powerful is this reproductive energy, that if only a single ray be left, this has the power of reproducing in time the normal number. Sir John Dalrymple, who kept a number of the *Asteriadæ* in his experimental tanks for some time, was able to watch the development of some which had lost one or more rays; and Sir John says, "On the tenth of June a single ray was found, which had either separated from an entire specimen, or it was the residue of one having lost the other parts. It showed no symptoms of reproduction at the time; but on the fifteenth the rudiments of four additional rays were indicated by four papillary prominences projecting the sixteenth of an inch from the broader end. Next evening one of these had attained nearly double the size, the others were less advanced; but a small orifice, the mouth, was forming in the centre. The whole ray now extended about thirteen lines."†

In the reproduction of lost limbs the star-fishes are nearly related to the crustacea; and in the next division of the *Echinodermata*, the *Holothuriadæ*, these can not only reproduce external parts of their bodies, but can replace their

* "Owen's Lectures, 1843; *Echinodermata*."

† "Powers of the Creator."

whole intestinal system. For it is a peculiarity of these creatures that, when alarmed, or rapidly taken out of their native element, they not only suddenly deprive themselves of their tentacular organs, but they eject their entire viscera without depriving themselves of life.

Professor Grube is reported to have met with an Echinid with a perfectly soft integumentary system, and, as Professor Rolleston has remarked, "that the structural differences between such an animal and a Holothurian would be comparatively small, the resemblances many."† This creature, then, would form an excellent connecting link between the Echini and the comparatively soft-bodied Holothurians.

In the present division, the "Echinodermata," Devonshire is very well represented, for out of the sixty-three species given for the whole of the British seas, forty-six of this number have been found around our own shores. All the animals composing this section of the animal kingdom are, so far as is known, inhabitants of the sea: none that I am aware of have been found in fresh water in any part of the globe.

CATALOGUE.

WITH NOTES AND OBSERVATIONS.

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† "Forms of Animal Life."

Class, ECHINODERMATA, Kln.

Order I. CRINOIDEA, Auct.

Fam. I. ANTEDONIDÆ.

GENUS I. ANTEDON, Fréminville.

ROSACEUS, Linck (*Comatula*).

Forbes, British Star-fishes; *Carpenter*, Phil. Trans., 1866, pl. 39-43, p. 5, t. 1.

Frequent on the south coast, Plymouth, Torbay, and at Ilfracombe. Salcombe Bay Mr. Hincks found specimens of *Salicornaria farciminooides*, studded with the young of this beautiful species. In tide-pools at Exmouth.

Order II. OPHIUROIDEA.

Fam. II. OPHIURIDÆ, Gray.

GENUS, OPHIOTHRIX, Müller.

FRAGILIS, Müller (*Ophiocoma rosula*).

Forbes, Brit. Star-fishes, p. 60; *O. minuta* (Young).

Common on the south coast. Taken off Teignmouth, 1842, in great numbers. Ilfracombe, Salcombe Bay; common.

GENUS, AMPHIURA, Forbes.

ELEGANS, Leach (*Ophiocoma neglecta*).

Forbes, Brit. Star-fishes, p. 30.

Under stones between tide marks, Exmouth, and all along the coast; frequent. Very difficult to preserve whole on account of its breaking up.

BRACHIATA, Montague.

Linn. Trans., t. 7, p. 84; MS. t. 25; *Forbes*, Brit. Star-fishes, p. 45.

This is a remarkable long-armed grey species, coloured after nature in Montague's Manuscript, as referred to above. Found in sand in Salcombe Bay.

FILIFORMIS, O. F. Müller (*Ophiocoma filiformis*).

Forbes, p. 40.

Taken in Plymouth Sound, behind the Breakwater. *Brit. Ass. Report*, 1866.

GENUS, OPHIOCOPA, Agassiz.

NIGRA, O. F. Müller.

Zool. Dan., vol. iii., t. 93, f. 1-4, p. 20; *O. granulata*, *Forbes*, Brit. Star-fishes, p. 50.

Torbay, rather rare; south coast; Bellamy, *Nat. Hist. South Devon*, p. 273. Taken off Plymouth.

GENUS, OPHIOPHOLIS, Müller.

ACULEATA, O. F. Müller.

Forbes, Brit. Star-fishes, p. 53 (*O. bellis*).

GENUS, **OPHIURA**, *Lamarek.***LACERTOSA**, *Pennant.**Forbes*, Brit. Star-fishes, p. 22.

This is a frequent species on our sandy shores. Exmouth Warren, &c. Thrown up by the waves.

ALBIDA, *Forbes.**Brit. Star-fishes*, p. 27.

Dredged in Salcombe Bay.

Fam., **ASTROPECTINIDÆ.**GENUS, **ASTROPECTEN**, *Linck.***IRREGULARIS**, *Pennant* (*Asterias aurantiaca*).*Forbes*, Brit. Star-fishes, p. 130.

Frequent on our sandy parts of the south coast.

GENUS, **LUDIA**, *Forbes.***SAVIGNII**, *Andouin* (*L. frágillissima*).*Forbes*, Brit. Star-fishes, p. 135.

Taken occasionally amongst trawl refuse off Plymouth.

SARSII? (*Duben and Koren*).*Alder*, in Ann. Mag. Nat. Hist., 3rd series, v. 5, p. 74, t. 5, f. 2.

Taken off Plymouth.

Family, **SOLASTRIDÆ**, *Forbes.*GENUS, **PALMIPES**, *Linck.***PLACENTA**, *Pennant* (*P. membranaceus*, *Ratz*).*Forbes*, Brit. Star-fishes, p. 116.

Dredged off Teignmouth in considerable numbers, 1863. A very handsome species when alive, but fade to a dirty yellow in the cabinet.

GENUS, **ASTERINA**, *Nardo.***GIBBOSA**, *Pennant.**Forbes*, Brit. Star-fishes, p. 119.

Tor Abbey Sands; P. H. Gosse. Anstey's Cove, &c.

GENUS, **SOLASTER**, *Forbes.***PAPPOSUS**, *Linn.**Forbes*, Brit. Star-fishes, p. 112.

Plymouth Sound; Torbay; Salcombe Bay.

ENDECA, *Forbes.**Brit. Star-fishes*, p. 109.

Salcombe Bay.

GENUS, **PORANIA**, *Gray.*

PULVILLUS, *O. F. Müller* (*Goniaster Templetoni*).

Forbes, Brit. Star-fishes, p. 122.

Taken in Plymouth Sound by Dr. Leach; sometimes brought in by trawlers from deeper water.

GENUS, **GONIASTER**, *Agassiz.*

PHRYGIANUS, *Parelius* (*G. equestris*).

Forbes, Brit. Star-fishes, p. 125.

South Coast ; Bellamy, *Nat. Hist. South Devon*, p. 273.

GENUS, **CRIBRELLA**, *Agassiz.*

SĀNGUINOLENTA, *Müller* (*C. oculata*).

Forbes, Brit. Star-fishes, p. 100.

Dredged off Teignmouth. My specimen measures six inches from tip to tip.

Fam., **ASTERIADÆ**, *Gray.*GENUS, **ASTERIAS**, *Linnæus.*

RUBENS, *Linn* (*Uraster rubens*).

Forbes, Brit. Star-fishes, p. 83.

Very common all round the coast. Dr. Gray suggests that this may be the female of the following. I am not prepared to answer this query ; but from what has been said I believe that they are all hermaphrodites.

VIOLENCEA, *O. F. Müller* (*Uraster violcea*).

Forbes, Brit. Star-fishes, p. 91.

Torbay ; taken with the above.

GLACIALIS, *Linn.*

Forbes, Brit. Star-fishes, p. 78.

Salcombe Bay ; Rev. T. Hincks ; very fine off Budleigh Salterton. A specimen brought me by my friend H. J. Carter, F.R.S., measured nineteen inches long from tip to tip of its rays, and the rays measured two inches in diameter at the base. The pedicellaria are large, and something like a bird's bill, white and finely punctured on the outside ; the edges of the fingers, or mandibles, are set with fine acute teeth. The apice of one of the mandibles is somewhat truncated, and at the end of truncation stands a strong tooth on each side, divided into several small cusps at the top ; the other, or lower mandible, shuts into this truncation between the strong teeth.

Fam., ECHINIDÆ, Agassiz.

Order, CIDARITES, Lamk.

GENUS, ECHINUS, Linn.

SPHÆRA, Müller.

Zool. Dan. Prod., 2845; *Forbes*, Brit. Star-fishes, p. 149.

Taken in Torbay, Plymouth, &c.

MILIARIS, Leske.

Forbes, Brit. Star-fishes, p. 161.

Generally distributed along the south coast, and abundant near Ilfracombe.

FLEMINGII, Ball.

Forbes, Brit. Star-fishes, p. 164.

This is the finest of all the British Echini. I have a specimen dredged in Torbay measuring five inches and one-eighth in diameter, and three inches and two-eighths in height. I purchased this specimen of the well known Mrs. Whyatt, of Torquay, the assistant and companion of Mrs. Griffiths of European celebrity, who assured me it was dredged in Torbay.

FASCIATUS, N. S. (?)

Depressed, spherical, yellow, spines of two kinds, the longer and larger strongly striate, both longitudinally and transversely. The longitudinal striae are quite three times the width of the ridges.

Mouth central, and very prominent. Around the mouth at the base is a bright rosy red ring, composed of minute coloured granules. The spines are long for the size of the animal— $\frac{1}{20}$ of an inch—the ridges of which are notched, or crocketed, having just the appearance of *Cidaris serriifera* on a small scale.

Rather beyond the middle of each large spine is a broad band of crimson red, giving this little species a very pretty appearance. Size of specimen, one line in diameter; height, $\frac{1}{20}$ of an inch.

I met with this on the shell of *Pecten maximus*, taken on the south coast of Devon. It was embedded amongst roots of corallines growing on the shell.

This may after all be only the young of one of our species. At the same time the spines do not agree with any of them in the larger growth that I am acquainted with.

GENUS, *ECHINOCYAMUS*, *Leske*.*PUSILLUS*, *Müller*.

Zool. Dan., t. 91, f. 5, 6; *Forbes*, Brit. Star-fishes, p. 175.

Taken on the south coast of Devon, and specimens are sometimes found in shell-sand on various parts of the north coast.

GENUS, *SPATANGUS*, *Klein*.*PURPUREUS*, *Müller*.

Zool. Dan., t. 5; *Forbes*, Brit. Star-fishes, p. 182.

Taken occasionally off Plymouth; Mr. Stewart.

GENUS, *AMPHIODOTUS*, *Agassiz*.*CORDATUS*, *Pennant*.

Brit. Zool., v. 4, t. 34, f. 75; *Forbes*, Brit. Star-fishes, p. 190.

This is the commonest of all our species. It is sometimes cast ashore in great numbers on Exmouth Warren, and other sandy parts of our coast.

ROSEUS, *Forbes*.

Brit. Star-fishes, p. 194.

This is occasionally taken on our coast.

ECHINODERMATA.

SECTION, HOLOTHURIA.

THE members of this section of the Echinodermata are not at first sight very inviting animals to the non-scientific observer, for when in a quiescent state several of them have more or less a repulsive aspect; but when the specimens are quite recent from their native deeps, and at once transferred to an experimental tank, they soon put forth their beautiful dendritic tentaculæ. In some species these organs are elegantly coloured, in others nearly white; some of them are simply branched, others are again furcated into numerous ramifications. These latter remind one very much of the circulatory system of the blood in the human subject, as we see it depicted in the lecture-room diagrams. These have been regarded by many as the lungs of these animals, and that they are pushed out into the surrounding medium to extract oxygen from the water. Professor Rolleston does not regard the dendritic appendages placed round the oval orifice as respiratory or aërating organs, but as peristomial ambulacral tentacles, and performing, to a certain extent, the same functions as the

ambulacral feet, with which these animals are provided in abundance ; and Professor Owen says, "These tentacles may be likened to a more complicated form of the ordinary tube-feet of the body, each being connected at its base with a long hollow sacculus, and being distended and protruded by the injection of the fluid therein contained."

The true office of these organs appears to be that of sweeping the water in the immediate neighbourhood in which the animal is placed, and securing or driving down to the mouth anything found floating in the water.

The function of aërating the blood is carried on through the orifice at the posterior end of the body, communicating with the branchial trees; at least it is so believed ; but Professor Rolleston does not appear to speak in very positive terms upon this point, for he says, "This term may be applied to the terminal segment of the intestine, inasmuch as though it does not receive the duct of the generative organs, it does receive those which lead from or into the so-called respiratory trees, the functions of which, there is good reason to think, are as much depuratory or renal as respiratory." This, then, opens the question again as to whether any aeration of the blood of these animals does really take place in these oral appendages ; for in *Psolus phantapus*, when the animal is alive, the oral appendages are spread open in such a manner as to make it almost impossible for them to be used for securing food.

Accident, and sometimes self-mutilation, deprive these creatures of these tentacular apparatus. This for the time must be very inconvenient ; but they manage to sustain life until other tentacula have replaced the lost ones, and which they do in a moderately short time. "Fifteen weeks," says Sir John Dalyell, "having elapsed from the date of mutilation, the regenerated portion had not only recovered its most important organs, but all these were discharging the wonted natural functions, sweeping the water, then curving into the mouth, which dilated for their reception, and contracting as they withdrew."

The specimen on which Sir John made these observations was a very healthy one, and did not appear to suffer in the least from this self-sacrifice of these important organs. But this peculiarity is not confined to these creatures ; for the higher section of this group of Echinodermata, the Asteroidæ, can, and frequently do, throw off an arm or ray to escape an enemy, or when handled ; these also are replaced by new organs.

These creatures have another remarkable characteristic, and one which is almost peculiar to their class, and that is, when they are brought suddenly to the surface of the water, or seized by the hand, they immediately either rupture themselves, sometimes through their whole length, or they eject a part or all of their viscera at once ; but even this does not kill them ; they survive this turning out, and in course of time these are replaced by new ones. "The loss and regeneration of such an assemblage of important parts, those whereon the sustenance and safety of the animal apparently depend, affords an ample field for the profoundest meditation."*

To pursue this self-mutilation still further, some of the species divide themselves into numerous pieces very much in the way of some Annelids. This, in a physiological point of view, is very remarkable. In annulose animals this dividing does not appear so extraordinary ; but in these creatures it is very remarkable, as this annular arrangement is of a very imperfect character ; at the same time they sever themselves into as many pieces as they please. It would almost appear from this, that what we look upon as one animal is in reality a composite body, composed of a great many animals of the same kind slightly attached together ; for all this dividing and sub-dividing does not destroy the vitality of these complex creatures ; each part has the power of growing the dendroid tentacular processes, and the ruptured alimentary canal must also arrange itself so as to carry on its functions as if nothing had happened.

We can only compare the dividing process to that of the common tape-worm, every segment of which is capable of growing into what we are in the habit of calling a perfect animal ; and, indeed, the more we study these two groups, the Annelids and the Holothuria, the closer they appear to approximate, until the two sections become so dovetailed into each other that it seems impossible to separate them.

Professor Rolleston confirms the above remarks. He says, "On the other hand, there can be no doubt that the Echinodermata as a whole present, both in their life-history, and in their anatomical structure, many points of affinity ; firstly, to the Vermes as a whole ; and secondly, to each of the four great orders into which they are divided. The passing through a larval stage, in which locomotion is effected by zones or circlets of cilia, is common to the majority of Vermes, and to almost every Echinodermata."†

* Sir J. Dalyell. † "Forms of Animal Life," p. 153.

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Order, SIPUNCULIDÆ, Gray.

Fam., THALASSÆMACEÆ, Forbes.

GENUS, THALASSEMA, Cuvier.

NEPTUNI, *Gærtner.*

Forbes, Brit. Star-fishes, 259; *Mont.* MSS., t. 27, f. 3; and in Lin. Trans. v. xi., t. 5, f. 2, p. 24.

This is copied as a "tail piece" in Forbes's Star-fishes. This curious creature, so far as is at present known, is peculiar to the shores of Devon and Cornwall. It is found in holes in the rocks. The specimen I have was procured by Mr. Walker in a piece of the ore-stone at the entrance to Torbay. It has also been "taken by Mr. Harvey at Teignmouth" (Forbes). In holes of rocks outside the Breakwater, Plymouth; Mr. Spence Bate and Mr. Rowe.

GENUS, ECHIURUS, Cuvier.

VULGARIS, *Savigny.*

Forbes, Brit. Star-fishes, 263.

Fam., PRIAPULACEÆ, Forbes.

GENUS, PRIAPULUS, Lamarck.

CAUDATUS, *Lam.*

Forbes, Brit. Star-fishes, 256.

This has a geographical range from Zetland to our shores, where it was found by Dr. Coldstream.

Fam., SIPUNCULACEÆ, Gray.

Genus, SIPUNCULUS, Linnæus.

BERNHARDUS, Forbes.

Brit. Star-fishes, 251; *Montagu*, Linn. Trans. vii., p. 74-6; MSS., t. 51, * f. 3 (*S. dentalis*).

Col. Montagu says: "This animal is parasitical, taking possession of the old shells of *Strombus-Pes-Pelicanus*, to which it seems peculiar; for in no one instance have we been able to discover it elsewhere." But Professor Forbes found it in other shells, such as *Littorina littorea*, and *Turritella terebra*; and Dr. Gray met with it in *Dentalium Entalis*; so that Montagu's name of "*Strombus*" would not convey a proper significance as to the habits of the animal. In holes in rocks outside the Breakwater, Plymouth.

GENUS, SYRINX, Bohadsch.

SACCATUS, Linn.

Syst. Nat. xii., p. 1078; Geml. 3095, 2; Flem., Brit. Anim., 491; Mont. MSS., t. 31, f. 4, p. 135-6 (*S. spinosus*).

The following is Col. Montagu's description of this somewhat doubtful species, and of which Forbes, I presume, merged into *nudus*: (*S. spinosus*) "Cylindric, the mouth surrounded with fimbria, behind which are numerous annulations of recurved spines. Body capable of considerable contraction, of a dull orange colour, sometimes livid white, inclining to flesh-colour about the posterior end. In an extended state the anterior end, for about one-third its length, becomes smaller, and makes the commencement of the siphon. The lateral foramen is very small, situated like the last (*nudus*); the mouth is surrounded by numerous fimbria, apparently in a double series; these are flatish and obtuse. This part is subclavated, on which appear about twenty annulations of minute black spines behind the fimbriated mouth. Length eight inches, inhabits similar places with the preceding species (*nudus*), but less frequent. This is more flexible, and consequently has more extensive powers of contraction and expansion than *S. nudus*; but when first taken the skin is far from being loose, as *saccatus* is usually described to be. If kept for some time even in sea water, the skin becomes lax, which is never the case with *nudus* until actually decayed. The siphon is never so much inverted as the last mentioned species. This grows to a much larger size than *nudus*, and when full grown is not so smooth, but appears

slightly reticulated to the naked eye, and when examined with a lens is observed to be covered with minute pores, 'the ends scabrous.'

This appears to be a distinct species; but I do not feel at all certain that it is *S. saccatus* of Linnæus; for his description is so brief, that it is almost impossible to say what is really intended. The spinose neck appears to distinguish this from all other described species. At the same time I would wish to draw the attention of naturalists to this.

NUDUS, *Linnæus.*

Forbes, Brit. Star-fishes, 245.

Buried beneath the sand on various parts of our south coast. Teignmouth; W. Harvey.

Taken in holes of rocks outside the Breakwater, Plymouth; Bate and Stuart. Exmouth and North Devon; not common. The transverse striæ are about one-twentieth of an inch apart, and the longitudinal ones the same, so that the whole surface is very distinctly reticulated. The impressed lines forming the reticulations have a bright brassy reflection, so that it appears as if the reticulations were bound with fine brass wire. Prof. Forbes calls it rugose. This is too harsh a term; the animal is quite smooth, except being reticulated. The little squares formed by the impressed lines are quite smooth, and reflect a purplish iridescence. The anterior for about half-an-inch is covered with small triangular scales, their apices pointed backwards; *not imbricated*. This specimen was seven inches long, and half-an-inch in diameter in the middle. Taken at Exmouth, July 8th, 1866.

This creature extruded while under examination what I take to be a mass of eggs. They were a number of quadrate bodies of a yellowish colour, arranged in parallel lines of four series, each forming together an elongate-quadrata mass. These quadrate bodies were filled with minute spherical grains of a pale yellow colour.

HARVEII.

Forbes, Brit. Star-fishes, 249.

This distinct species was named by Prof. Forbes as a small mark of esteem to its discoverer, Mr. Harvey, who for so many years investigated the marine fauna of Teignmouth, where this was found. This species is well de-

scribed by Prof. Forbes, except that he does not mention the colour, which is orange yellow, except the two extremities, which are blackish from the lines forming the reticulations. When fresh my specimen measured three inches and a half. This I obtained at Exmouth, July 8th, 1867.

GLANDULOSUS.

Mont. MSS., t. 27, f. 1, p. 150 (Holothura).

Mouth surrounded with papillæ-like tentacles ; an appendage at the posterior end furnished with vesicular papillæ. Body when extended is usually cylindrical, but in a contracted state clavate, covered with tubercles of a dark purplish red-colour, the posterior end terminated with a white appendage surrounded with many large diaphanous concave vesicles (intended apparently for the purpose of adhesion); it does not appear to be retractile. The mouth is surrounded with papillæ or tubercles similar to those on the body, and, like them, capable of turning quickly on either side. Length, one inch. Coast of Devon ; rare.

This singular species was found attached by its posterior vesicles to the inside of a case of *Terebella conchilega*, and continued in its situation while the drawing of it was completed. Col. Montagu says, "It must be confessed this animal is not strictly a *Holothuria*; in some respects it approaches the genus *Clara* by its form when contracted, and by being fixed by its peduncle to other bodies; like that genus, it appears to possess but one aperture. Strictly, it probably belongs to no genus hitherto formed, and might constitute a new genus, together with *Priapulus* (*Holothuria*) of Zool. Danica."

This is, as Col. Montagu remarks, a singular animal; and from the description of the genus *Clara* in *Systema Natura*, Gmeln edit., No. 3131, it would appear to be very nearly allied to that genus. It also appears to have some claim upon the genus *Priapulus*; and it also seems to have some relation to the genus *Syrinx*. I have consequently placed it here provisionally; and I hope when it turns up again its true position may be ascertained.

Order, HOLOHURIDÆ, Gray.

Fam., SYNAPTAE, Forbes.

GENUS, CHIRODOTA, Eschscholtz.

DIGITATA, Montagu.

Linn., Trans. xi., t. 4, f. 6, p. 22; *Forbes*, Brit. Star-fishes, 239.

Coast of Devon, rare.

GENUS, **ONCUS**, *Forbes and Goodsir.*BRUNNEUS, *Forbes.*

Brit. Star-fishes, p. 229.

Dredged in Plymouth Sound, not uncommon.

Fam., **THYONES**, *Forbes.*GENUS, **THYONE**, *Oken.*PAPILLOSA, *Müller.**Forbes*, Brit. Star-fishes, p. 235.

Tentacles ten, two shorter than the others; the shortest and most active is placed opposite the narrowest part of the mouth, and is used as a finger to push food into its mouth. The antennæ are either bi or tri-pinnate, pedunculate pale yellow, with two or three black dots on each of the pinnæ towards the base; mouth black, ovate, the margin set round with a series of square, flattened, teeth; neck, when extended, about four lines long, white, with five large and strong longitudinal muscles; these converge about one inch inside round the æsophagus. The skin is very thin and transparent, showing the muscular apparatus, which is composed of five powerful longitudinal muscles; these are banded or held together at equi-distances by numerous transverse threads, so that we have here a complete net-work of muscles; and by the contraction or elongation of this apparatus the body of the animal is constantly being changed in form. Sometimes the body has one or two constrictions, as if it were tied round with one or two ligatures, the inter-space being at the same time very much inflated, giving the creature a very curious appearance. At another time the whole body is inflated into a long fusiform sac, and again the muscles will contract near the head, and gradually go on to the posterior, so that you then have a parallel cylindrical form. When it is contracted near the middle of the body, the animal has very much the appearance of the air bladder of a fish. The whole epidermis is covered with papillæ; these are placed in lines, to a certain extent, on and towards the anterior portion of the body; but they are scattered, with no degree of regularity, over the rest of it.

It is believed by some naturalists that these papillæ are used by the animal to attach itself to different bodies; but I am not able to confirm this from my own observations. The apex of the abdomen is terminated with five white spine-like processes.

Taken off the coast near Exmouth, 1866.

*Fam., PENTACTÆ, Forbes.
GENUS, CUCUMARIA, Jæger.*

COMMUNIS, Forbes and Goodsir.

217 (*H. viridis*), Montagu, MSS., t. 2, f. 5, p. 144.

I believe I am right in referring Col Montagu's *H. viridis* to this species. At the same time I do not feel certain. I therefore transcribe the description: *H. viridis*, with ten ramosc tentacula of equal size, papillæ with cyathiform summits. Body rigid, sub-cylindrical, pale green, with long clavate papillæ. The tentacula are yellowish, long branched, and equal in size; the space between them and round the mouth, dark green. Length, one inch. Coast of Devon.

Observed by this, it may be recognized again, and so determine whether it be the young of *C. communis*, which I am inclined to regard it.

Col. Montagu describes what he calls *H. decollata* from the specimen throwing off all its branchia (tentacula), or oral apparatus. This appears, from his description, to be an intermediate species between the Scotch and Irish specimens described by Forbes (*C. communis*). The body of this was dull yellow, with the peduncles of the tentaculæ pinkish, and the branches purple, the finer ramifications hyaline; length of specimen six to seven inches.

PENTACTES, Müller.

Forbes, Brit. Star-fishes, 213; *Mont.* MSS., t. 15, f. 1, t. 27, f. 3, p. 141, also p. 145. (*H. arcuta*), t. 43, f. 6, variety.

A very variable species, both as regards colour and its protean forms. Coast of Devon; frequent.

Var. Montagui, Fleming Brit. Anim., p. 483.

HYNDMANI, Thompson.

Forbes, Brit. Star-fishes, p. 225.

In holes made by *saxicava* outside the Breakwater, Plymouth; Bate and Stuart.

*Fam., PSOLIDÆ, Forbes.
GENUS, PSOLUS, Oken.*

PHANTAPUS, Linn.

Forbes, Brit. Star-fishes, 203; *Dalyell*, t. 15.

Found from Devon to Zetland. This is perhaps the finest species in the British Seas; and Sir John Dalyell has done it full justice in the beautiful figure he has given of it.

HOLOTHURIA, Gmel.

NIGRA, Peach.

Not uncommon in Plymouth Sound. Bate and Stewart, Brit. Ass. Report, 1866.

THE RAINFALL IN DEV

Distances and Directions
of the
Centre of Dartmoor.

6.5	miles S.W.
11	," W.
5	," W.N.W.
8.5	," W.N.W.
8	," N.W.
6.5	," N.N.W.
12.5	," N.N.E.
9.5	," N.E.

IN DEV

rections

moot.

E RAINFALL IN DEVONSHIRE IN 1871, AND
IN THE SIX YEARS ENDING WITH
DECEMBER 31st, 1871.

BY W. PENGELLY, F.R.S., F.G.S.

(Read at Exeter, July, 1872.)

N.

N.W.

N.W.

W.

N.W.

N.E.

E.

introducing this communication it is only necessary to state that the data on which it is based were obtained from Symons's *British Rainfall* for 1871, and that it has been drawn up on the principle used and explained in the paper on the Devonshire Rainfall, read in 1868, 1869, 1870, 1871.*

PART I. TABLE I.

ations:—The Stations in Devonshire from which rainfall returns have been published for 1871 are more numerous than in any former year. Table I. in the present paper contains 59 stations, against 56 in 1870, 42 in 1869, 32 in 1868, 36 in 1867, and 33 in 1866. Those now introduced for the first time are Polapit, Seaton, and Clawton—numbered respectively 14, 31, and 55. Hele (No. 38), from which no returns were received last year, is now re-inserted.

Mongst the new stations, Polapit and Clawton (Nos. 14 and 35) are valuable additions to the gauges in the district they represent. The same may be said respecting Seaton (No. 31) in East Devon.

It is to be regretted that no returns have been received from Hopsteighton for 1871.

The numerals in the third column show the number of

See "Trans. Devon Assoc.," vol. ii. pp. 560-577; vol. iii. pp. 163-165; vol. iv. pp. 69-72, and 654-670.

years over which the observations extend at each station. At 26 the guages have been in continuous operation for six years.

Height above the Ground :—The only change in the height of the top of a guage above the ground is that at Burton (No. 23), where, instead of 6 feet, as last year, it is now 1 foot above the surface. At the new stations the heights range from 3 feet to 13 inches. In the entire series the heights vary from 35 feet at Plymouth (No. 17) to 2 inches at Prince's Town (No. 9), and average 2 feet 8 inches, against 2 feet 10 inches in 1870.

Height above the Sea :—A few changes have been made in the heights of the gauges above the sea level; the most important being that at Widdecombe (No. 3), where in 1871 the gauge was 810 feet above the sea, instead of 700 feet in 1870. The stations from which returns have been made on this point vary from 1500 feet at Rundle Stone (No. 10) to 25 feet at Ilfracombe (No. 50), and average 354 feet, against 357 feet in 1870.

The Rainfall in 1871 :—It is shown at the foot of the ninth column that the average rainfall of the entire county in 1871 was 42.72 inches or 40.01 inches, according as the Dartmoor stations (Widdecombe, Holne, Lee Moor, Sheepstor, Prince's Town, and Rundle Stone—Nos. 3, 6, 7, 8, 9 and 10) were or were not included. The same column shows that the greatest rainfall at any station in 1871 was that at Rundle Stone (No. 10), and amounted to 74.04 inches. The least fall was at Hele (No. 38), where no more than 27.90 inches were registered—a quantity which bore to the greatest fall in the county the ratio of 377: 1000.

From 1866 to 1869 inclusive, the distinction of being the wettest station in Devonshire was enjoyed by Prince's Town (No. 9); but in 1870 and 1871 it was surpassed by the new station at Rundle Stone (No. 10), about a mile towards the north-west, and 100 feet higher above the sea.

The greatest and least annual falls in the county during the six years ending with 1871 are shown below:—

TABLE II.

	1866	1867	1868	1869	1870	1871
Station of greatest fall .	Prince's Town.	Prince's Town	Prince's Town	Prince's Town	Rundle Stone	Rundle Stone
Do. least do. .	Tcign-mouth	Hele	Burton	St. G. Clyst	North-am	Hele
Greatest falls in inches .	94.66	79.98	77.65	75.00	52.35	74.04
Least do. do. .	25.36	30.09	27.52	34.68	19.12	27.90
Relative greatest fall .	1000	845	820	792	553	782
Do. least do. .	1000	1186	1085	1368	754	1100

The falls in 1871 at the six Dartmoor Stations varied from 56.21 inches at Sheepstor (No. 8) to 74.04 inches at Rundle Stone (No. 10), and averaged 66.70 inches; which bore to the average of the remaining fifty-three stations the ratio of 100 : 60.

The greater county average rainfall (42.72 inches) in 1871 was exceeded at 23 stations, but not reached at the remaining 36; whilst the lower average (40.01 inches) was surpassed at 30 stations, but 29 fell below it.

With the exception of Meshaw (No. 46), every station 500 feet and upwards above the sea had comparatively great rainfalls.

It has been remarked in previous papers that the rainfall returns from Plymouth (No. 17) were below those from stations in its immediate neighbourhood, and that the fact was probably due to the great height of the gauge above the ground. The same fact presented itself in 1871; for supposing the district to be represented by Ham, Saltram, and Ridgeway (Nos. 16, 18, and 19), its gauge, which is 33.75 feet above the mean height of those at the stations just named, received no more than 86.5 per cent of their average rainfall, as is shown below:—

TABLE III.

	Height above ground.	Rainfall in inches.
Ham	3 ft. oin.	45.75
Saltram	3	46.88
Ridgeway	6	47.72
Means	1 3	46.78
Plymouth	35 0	40.50

Attention has been called more than once to the data supplied by Northam and Buckish (Nos. 53 and 54) in illustration of the influence of height of ground, and of its wet and dry sides. The latter of these stations is 550 feet high; the former is from 7 to 8 miles from it in a north-north-east direction, and its height is 173 feet. Their rainfalls during the six years ending with 1871 are shown below.

TABLE IV.

Years.	Rainfalls in inches.		Deficits at Northam.	
	Buckish.	Northam.	In inches.	Per cent.
1866	55·70	41·25	14·45	26
1867	46·51	34·15	12·36	27
1868	50·56	38·11	12·45	25
1869	48·09	36·44	11·65	24
1870	35·25	19·12	16·13	46
1871	47·25	35·23	12·02	25·5
Totals ...	283·36	204·30	79·06	28

Having returns from Ilfracombe (No. 50) for 1870 and 1871 only, it would be unsafe to regard its data as sufficient to warrant generalizations. When compared with Bratton Fleming (No. 49)—the station nearest to it—the average rainfall of the former is very small, the figures being 29·92 inches against 41·06 inches = 73 : 100. All the circumstances of the Ilfracombe gauge, however, concur to secure for it a small receipt of rain. Its top is 9 feet above the ground, which in its turn is but 16 feet above mean-tide level, and it is under the shelter of high ground in every direction except the north, which is certainly not a wet quarter.

The following are amongst what may be called the anomalies of the Devonshire rainfall statistics during 1871.

Bolt Tail and Burton (Nos. 22 and 23), though on high table land jutting into the English Channel, and unprotected from the Atlantic, still contend that they are comparatively dry stations—the rainfall at each in 1871 being below the

county average, even exclusive of Dartmoor; the deficits, however, were less than in previous years.

When speaking of Witheridge (No. 44) last year, it was remarked that its rainfalls in 1869 and 1870 were less than that at any other station in north-east Devon. The same remark applied to it during 1871, as is shown below:—

TABLE V.

Rainfall in 1871 at Bampton	41'21 inches.
Do. do. Rose Ash	38'25 "
Do. do. Meshaw	37'60 "
Do. do. Witheridge	31'16 "

It is to be regretted that no information is sent in respecting the size of the Witheridge gauge, or of its height above the ground or the sea.

Attention has been called in former years to the widely dissimilar returns from Lupton and Torquay (Nos. 26 and 27)—stations equally near the sea, at the same height above it, and equally protected by Dartmoor; but the former, on the south side of Torbay, having a gauge 12 inches in diameter and 42 inches above the ground, whilst the latter, on the north side of the same inlet, has a five-inch gauge placed 9 inches above the ground. Their rainfalls during the last four years are shown below:—

TABLE VI.

Years.	Actual Rainfalls in inches.		Relative Rainfalls.	
	Lupton.	Torquay.	Lupton.	Torquay
1868	47'71	39'19	100	82
1869	40'00	35'83	100	90
1870	30'03	25'00	100	83
1871	44'63	36'72	100	82
Totals . . .	162'37	136'74	100	84
Means . . .	40'59	34'18	100	84

Number of Wet Days :—Forty-one stations only—about two-thirds of the entire number—reported in 1871 the number of wet days, that is days on which not less than '01 inch fell. The twelfth column, Table I, shows that the greatest number was 226, at Prince's Town and Rundle Stone (Nos. 9 and 10); that the average number was 173; and that the least was 90, at Hele (No. 38),—the three numbers having the ratios of 169 : 100 : 52; that the average for the county was 37 days more than it was in 1870; and that the general average was exceeded at 21 stations, but not reached at 18.

Certain adjacent stations differed more, perhaps, than might have been anticipated in their annual numbers of wet days. Thus, Sheepstor and Prince's Town (Nos. 8 and 9), no more than four miles apart, made the following returns :—

TABLE VII.

Years.	Actual numbers of Wet Days.		Relative numbers of Wet Days.	
	Sheepstor.	Prince's Town.	Sheepstor.	Prince's Town.
1869	138	242	100	175
1870	107	186	100	174
1871	133	226	100	170
Totals ..	378	654	100	173
Means ..	126	218	100	173

The foregoing differences are no doubt partly ascribable to the fact that the height of Prince's Town above the sea exceeds that of Sheepstor by 600 feet. Ham and Ridgeway (Nos. 16 and 19), however, also four miles apart, having their gauges at nearly the same heights above the ground and the sea, sent in the following figures :—

TABLE VIII.

Years.	Actual Numbers of Wet Days.		Relative numbers of Wet Days.	
	Ham.	Ridgeway.	Ham.	Ridgeway.
1866	162	227	100	140
1867	162	199	100	123
1868	127	178	100	140
1869	133	193	100	145
1870	115	152	100	132
1871	137	179	100	131
Totals ..	836	1128	100	136
Means ..	139	188	100	136

Similarly, the annual numbers of wet days at Northam (No. 53) have, during the six years ending with 1871, always fallen below those at Buckish (No. 54), as shown in the following Table:—

TABLE IX.

Years.	Actual numbers of Wet Days.		Relative numbers of Wet Days.	
	Northam.	Buckish.	Northam.	Buckish.
1866	220	250	100	114
1867	194	217	100	112
1868	196	213	100	109
1869	190	208	100	109
1870	105	160	100	152
1871	178	196	100	110
Totals ..	1083	1244	100	115
Means ..	180·5	207	100	115

Probably the most striking discrepancy of this kind in 1871 was that of Hele and Bramford Speke (Nos. 38 and 37). Though the stations are but five miles apart, and have their gauges at nearly the same height above the ground and the sea, their annual numbers of wet days were 90 and 201 respectively, or as 100 : 223.

Mean Wet-day Rates of Rain :—As is shown in the fifteenth column, Table I., the mean wet-day rates of rain during 1871 varied from .42 inch at Sheepstor (No. 8) to .17 inch at Bramford Speke (No. 37), and for the entire county averaged .25 inch. Bramford Speke and Sheepstor were also the extremes of the scale in 1870.

Of the 41 stations whence the necessary returns for computing this element were received, the general average was exceeded at 25, equalled at 3, and not reached at 13.

Mean Annual Rainfall during the six years ending with December 31st, 1871 :—In proceeding to the fifteenth and subsequent columns, Table I., containing the mean annual rainfall statistics for each station, as derived from the registers during the six years ending with 1871, it must be remembered that, as is pointed out in the third column, at several of the stations the observations have not extended over the entire six-year period.

Taking the figures as they stand, however, it appears that the mean annual rainfall for the county as a whole was 40.13 inches, or 37.98 inches, according as Dartmoor was or was not included; and that the former was exceeded at 25 stations but not reached at the remaining 34. If, however, the 34 stations from which returns have been received for less than six years be excluded, the mean annual rainfall of the remaining 25 varied from 73.90 inches at Prince's Town (No. 9) to 30.37 inches at Sidmouth (No. 30), and averaged 40.96 inches for the entire series as a whole—that is no more than .83 inch above the county mean given at the foot of the fifteenth column.

On comparing the ninth and fifteenth columns, Table I., it appears that in 1871 the yearly rainfall in the county as a whole was 2.59 inches above the six-year average; that, omitting those of but one year's standing, it was at twelve of the stations below, and at the remaining forty-four above, the average at the same stations respectively. The sixteenth column shows that the excess in the county as a whole was 6 per cent.; that the greatest defect was at Hele

(No. 38), where it amounted to 13 per cent.; and that the greatest excess was at Widdecombe (No. 3), where it reached 29 per cent. The last-named station, however, has had a standing of but two years.

Mean Annual Number of Wet Days during the Six years:

—The mean annual number of wet days at each station, and in the county as a whole, during the six years, will be found in the twenty-first column. Omitting the new stations, the numbers varied from 233 days, at Prince's Town (No. 9), to 108 days, at Hele (No. 38), and averaged 167. Including the new stations, the averages, with and without Dartmoor, were respectively 165 and 162 days.

Mean Wet-day Rate of Rain during the Six years:—As is shewn in the twenty-fifth column, the mean wet-day rates of rain varied from .41 inch, at Sheepstor (No. 8), to .18 inch, at Sidmouth, Clevelands, Broadhembury, and Brampford Speke (Nos. 30, 32, 33, and 37), and averaged .24 or .23 inch.

Recapitulation:—The following recapitulatory summary of the comparative rainfall statistics of Devonshire during 1871 may be of service here:—

1st. The total rainfall of the county as a whole was 42.72 inches in 1871, that is 2.59 inches, or 6 per cent., above its average annual fall during the six years ending with December 31st, 1871.

2nd. The total number of wet days in the county as a whole was 173 in 1871, that is 8 days, or 5 per cent., above its average annual number during the six years ending with December 31st, 1871.

3rd. The average daily wet-day rate of rain in the county as a whole was .25 inch in 1871, that is .01 inch, or 4 per cent., above its average annual rate during the six years ending with December 31st, 1871.

Turning now to the 25 stations at which the gauges have been in continuous operation during the entire period of six years. Their average annual rainfalls, from January 1st, 1866, to December 31st, 1871, inclusive, are shewn below:—

TABLE X.

Stations.	Average Annual Rainfalls.	
	Actual, in inches.	Relative.
Chagford . . .	49·27	120
Bovey Tracey . . .	42·04	102
Prince's Town . . .	73·90	179
Mount Tavy . . .	49·79	121
Tavistock . . .	46·95	114
Endsleigh . . .	49·92	122
Ham . . .	41·98	102
Plymouth . . .	40·50	99
Saltram . . .	43·79	106
Ridgeway . . .	46·04	112
Torquay . . .	36·59	89
Teignmouth . . .	33·26	81
Budleigh Salterton . . .	31·14	76
Sidmouth . . .	30·37	74
Broadhembury . . .	32·79	79
St. George's Clyst . . .	30·62	75
Exeter . . .	31·80	77
Bramford Speke . . .	33·41	81
Tiverton . . .	38·67	94
Cove . . .	40·27	98
Meshaw . . .	40·30	98
Castle Hill . . .	44·21	108
Barnstaple . . .	38·14	93
Northam . . .	34·05	83
Buckish . . .	47·22	115
Means . . .	41·08	100

The foregoing figures warrant the following generalizations :—

1st. That the greatest annual rainfall occurs at Prince's Town, and amounts to 79 per cent. above the average.

2nd. That, even exclusive of Prince's Town, the stations in the immediate neighbourhood of Dartmoor and in the south-west of the county, have, with the exception of Plymouth, rainfalls above the average ; and that taken as a whole from Chagford to Ridgeway, Plymouth included, their falls are 10 per cent. above the average.

3rd. That stations east of Dartmoor, from Torquay on the south to Tiverton on the north, both inclusive, have rainfalls below the average ; and that, taken as a whole, their falls are 19 per cent. below the average.

4th. That, with the exception of Barnstaple and Northam, stations north of Tiverton have, as a whole, rainfalls very near the average.

5th. That the least annual rainfall occurs at Sidmouth, and amounts to 26 per cent. below the average.

The following remarks on the foregoing generalizations may, perhaps, be not out of place :—

(a) The great rainfall at Prince's Town is, of course, due to the great altitude of the station—1400 feet above the sea.

(b) The comparatively small rainfall *registered* at Plymouth is, no doubt, ascribable to the fact that its gauge is 35 feet above the ground.

(c) The difference of rainfall at stations which are, and those which are not, east of Dartmoor, is due to the fact that, in consequence of the elevation of the land over which they have to pass, the wet winds—from the west and south-west—deposit a great part of their moisture before they reach the eastern stations.

(d) The small fall at Barnstaple is probably the result of the low position of its gauge—only 31 feet above the sea; whilst that at Northam may safely be ascribed to the high land on the west and south-west.

(e) Though at the end of the six years the average annual rainfall was less at Sidmouth than at any other of the twenty-five stations, it was but .25 inch below that at St. George's Clyst. Moreover it was the first instance during the six years of Sidmouth being thus distinguished.

Of the twenty-five stations just mentioned, no more than seventeen have registered their numbers of wet days. The average annual numbers, as well as their average wet-day rates of rain, are given below :—

TABLE XI.

Stations.	Average Annual Number of Wet Days.		Average Wet-day Rate of Rain.	
	Actual.	Relative.	Actual.	Relative.
Bovey Tracey . . .	171	97	.29 inch.	126
Prince's Town . . .	233	132	.32 "	139
Tavistock . . .	144	82	.33 "	143
Ham . . .	137	78	.31 "	135
Ridgeway . . .	188	107	.26 "	113
Torquay . . .	176	100	.21 "	91
Budleigh Salterton . . .	160	91	.19 "	83
Sidmouth . . .	168	95	.18 "	78
Broadhembury . . .	179	101	.18 "	78
Exeter . . .	138	78	.23 "	100
Bramford Speke. . .	189	107	.18 "	78
Tiverton . . .	203	115	.19 "	83
Meshaw . . .	196	111	.21 "	91
Castle Hill . . .	171	97	.26 "	113
Barnstaple . . .	189	107	.20 "	87
Northam . . .	181	103	.19 "	83
Buckish . . .	208	118	.23 "	100
Means . . .	176.5	100	.23 "	100

A glance at Table XI. shows that it is not easy to form generalizations respecting the average annual numbers of wet days. The only fact standing prominently forward is the great number at Prince's Town. The excess above the general average, however, amounts to no more than 32 per cent., whilst the excess of rainfall at the same station reaches 79 per cent., as has been already stated. The Table also denotes that an excessive number of wet days may be generally expected in North Devon, rather than in the east or south-west of the county.

The average wet-day rates of rain are more strongly defined, and very closely follow the order of the rainfalls, as the following generalizations show :—

1st. That all the Dartmoor and south-western rates, from Bovey Tracey to Ridgeway inclusive, are above the general average; and taken as a whole reach an excess of 31 per cent.

2nd. That, with the exception of Exeter, where the general average is exactly reached, all the stations east of Dartmoor,

from Torquay to Tiverton, both inclusive, have rates below the general average; and that the rate of the entire series, taken as a whole, is 15·5 per cent. below the general average.

3rd. That, taken as a whole, the stations north of Tiverton have a rate of 5 per cent. below the general average.

4th. That Sidmouth, Broadhembury, and Brampford Speke have the least wet-day rates of rain in the county, being 22 per cent. below the general average. In other words, in relation to their total rainfalls they exceed all the other stations in their numbers of wet days.

The general average annual rainfall statistics, at the end of each of the six years, at the stations, taken as a whole, named in Tables X. and XI., are given in the following Table:—

TABLE XII.

Length of Period.	Rainfall.		Wet Days.		Wet-Day Rate.	
	Actual.	Relative.	Actual.	Relative.	Actual.	Relative.
1 year = 1866	48·45 in.	1000	212	1000	'226	1000
2 years = 1866-7	45·72 „	944	201	948	'226	1000
3 years = 1866-8	45·49 „	939	193·5	913	'232	1027
4 years = 1866-9	44·05 „	909	190	896	'230	1018
5 years = 1866-70	40·92 „	845	179	844	'226	1000
6 years = 1866-71	41·08 „	848	176·5	833	'228	1009

An inspection of the Table detects the following facts:—

1st. That the average annual rainfall decreased continuously to the end of 1870, and that there was a slight increase in 1871.

2nd. That the average annual number of wet days decreased continuously to the end of 1871, and that the rate of decrease was not very different from that of the rainfall.

3rd. That the changes in the wet-day rate of rain have been less steady, and have never been considerable.

PART II. TABLE XIII.

Table XIII. is constructed to show the rainfall of Devonshire as compared with that of each of the other counties south of the Tweed and Solway, as well as with England and Wales as a whole, during 1871, and also during the six years ending with December 31st, 1871.

The second column shows the order in which the counties stood at the end of 1871 in regard to their rainfalls during that year—Merionethshire, the wettest county, opening the list, and Bedfordshire, the driest, closing it.

The numerals in the first column show the position of each county in the series.

The third column shows the number of gauges in each county. The number varies from 117 in Yorkshire to 1 in Anglesea, and averages 21 per county, that is one less than in 1870.

The average number of acres represented by each gauge in each county is shown in the fourth column, and varies from 6,743 acres in Middlesex to 138,884 in Anglesea, and averages 33,475 acres for the entire country. Each gauge represents an acreage below the average in 18 counties and above it in 34, Devonshire being in the former group. In other words, its gauges in relation to its area are more numerous than in England and Wales generally.

The fifth column shows the average height of the top of the gauge above the ground in each county. This height varies from 9 inches in Carmarthenshire to 12 feet 6 inches in Gloucestershire, and averages 3 feet 1 inch; that is the same as in 1870. The average was exceeded in 14 counties, but not reached in the remaining 38. Devonshire is in the former group; its height being 4 feet 4 inches.

The sixth column shows the average height of the gauges in each county, with the exception of Rutland, above mean-tide level. This varies from 20 feet in Anglesea to 1013 feet in Montgomeryshire, and averages 301 feet for the entire country; that is 6 feet more than in 1870. The general average was surpassed in 26 counties, but not reached in the remaining 25. Devonshire was among the former. The highest gauge in the country, so far as is known, is that at Deadwater, in Northumberland, at a height of 2,000 feet; whilst the lowest is 6 feet above the sea, of which there are at least two instances.

TABLE XIII.

SHOWING THE RAINFALL, &c., IN 1869, AND THE MEAN ANNUAL FALL, &c., DURING
1866, 1867, 1868, 1869, 1870, AND 1871, IN ENGLAND AND WALES.

37	Surrey	...	29	17212	4	0	212	2533	145	17	2505	146	17	37						
38	Kent	...	43	24103	2	7	190	2424	155	16	2461	147	17	39						
39	Lincolnshire	...	26	66896	2	11	67	2385	139	17	2418	149	16	42						
40	Rutlandshire	...	2	53864	0	10	..	2371	128	19	2324	131	18	47						
41	Norfolk	...	39	23855	3	2	92	2354	149	16	2432	150	16	41						
42	Middlesex	...	31	67434	8	9	163	2322	143	16	2408	147	16	44						
43	Hertfordshire	...	13	32934	2	2	321	2310	145	16	2538	151	17	35						
44	Buckinghamshire	...	7	57517	1	5	366	2279	99	23	2264	139	16	48						
45	Suffolk	...	21	43302	3	3	111	2267	144	16	2340	152	15	46						
46	Berkshire	...	14	40337	1	11	199	2252	143	16	2468	143	17	38						
47	Oxfordshire	...	15	36867	12	4	358	2211	135	16	2435	160	15	40						
48	Northamptonshire	...	11	57474	1	11	325	2197	151	15	2355	155	15	45						
49	Essex	...	21	46831	1	8	154	2165	141	15	2257	141	16	49						
50	Huntingdonshire	...	5	41073	1	10	192	2135	138	15	2026	139	15	52						
51	Cambridgeshire	...	15	38117	3	0	53	2094	145	14	2136	151	14	50						
52	Bedfordshire	...	10	30537	7	5	164	2069	122	17	2069	130	16	51						
	Means	...	21	33475	3	1	301	3230	158	21	3333	159	.21							
1	2	3	4	5	6	7	8	9	10	11	12	13								

The seventh column shows the average total rainfall in each county in 1871. The greatest, that of Merionethshire, amounted to 59·97 inches; the least, Bedfordshire, to 20·69 inches; whilst the average for the entire country was 32·30 inches, that is 4·60 inches, or 16·6 per cent., above that in 1870. The general average was exceeded in 19 counties, but not reached in 33. Devonshire, as usual, took its place among the former, or wet counties, its excess being 9·62 inches, that is 30 per cent.

The chief statistics respecting the rainfalls during the four years ending with 1871 are shown below:—

TABLE XIV.

	1868.	1869.	1870.	1871.
Greatest annual rainfall at any station in inches	207·49 ^a	198·91 ^a	119·60 ^b	115·15 ^b
Greatest mean annual rainfall in any county in inches	72·84 ^c	75·18 ^d	61·01 ^d	59·97 ^d
Least annual rainfall at any station in inches	7·84 ^e	17·44 ^f	11·54 ^g	13·59
Least mean annual rainfall in any county in inches	19·80 ^h	21·42 ⁱ	16·03 ^k	20·69 ⁱ
General mean annual rainfall per county in inches	34·44	35·62	27·70	32·30
Greatest annual rainfall in Devonshire in inches	84·30 ^r	75·00 ^l	54·70 ^m	79·36 ^m
Least annual rainfall in Devonshire in inches	30·09 ⁿ	25·56 ^o	19·12 ^p	23·58 ^s
Mean annual rainfall in Devonshire in inches	43·74	39·33	29·33	41·92

^a, The Sty in Cumberland. ^b, Seathwaite in Cumberland. (There were no returns from the Sty in 1870 or 1871.) ^c, Cumberland. ^d, Merionethshire. ^e, Sheerness. ^f, Cardington in Bedfordshire. ^g, Ely. ^h, Essex. ⁱ, Bedfordshire. ^k, Kent. ^l, Prince's Town on Dartmoor. ^m, Dartmoor Prison Garden and Rundle Stone on Dartmoor. ⁿ, Hele. ^o, Teignmouth. ^p, Northam. ^r, North Hessary Tor on Dartmoor. ^s, Sidmouth.*

* See return by S. Chick, Esq., in "Symons's British Rainfall," 1871. p. 174.

The eighth column of Table XIII. contains the average number of wet days during 1871 in every county. The number varied from 200 in Anglesea to 99 in Buckinghamshire, and averaged 158 for the entire country. The general average was exceeded in 23 counties, but not reached in 29.

The chief statistics, so far as this paper is concerned, respecting the number of wet days during 1868, 1869, 1870, and 1871 are shown below:—

TABLE XV.

	1868.	1869.	1870.	1871.
Greatest number of wet days at any station .	236 ^a	224 ^b	225 ^c	257 ^r
Greatest mean annual number in any county .	203 ^d	210 ^e	182 ^e	200 ^e
Least number at any station .	77 ^f	80 ^g	57 ^h	62 ^s
Least mean annual number in any county .	122 ⁱ	136 ^k	100 ^l	99 ^t
General mean annual number per county .	156	165	133	158
Greatest annual number in Devonshire .	236 ^m	242 ^m	186 ⁿ	226 ⁿ
Least do. do. .	1030	1000	100 ^p	900
Mean do. do. .	173	170	133	164

^a, Seathwaite in Cumberland. ^b, Llanberis in Carnarvonshire. ^c, Harrow on the Hill. ^d, Merionethshire. ^e, Anglesea. ^f, Beeston Lock in Nottinghamshire. ^g, Rothbury in Northumberland. ^h, Sleaford in Lincolnshire. ⁱ, Rutlandshire. ^k, Bedfordshire. ^l, Kent. ^m, Prince's Town on Dartmoor. ⁿ, Prince's Town and Rundle Stone on Dartmoor. ^o, Hele. ^p, Kingsbridge. ^r, Melbury in Dorsetshire. ^s, Blandford in Dorsetshire. ^t, Buckinghamshire.

In the ninth column are given the average wet-day rates of rain in each county during 1871. These varied from ·33 inch in Westmoreland and Brecknockshire to ·14 inch in Cambridgeshire, and averaged ·21 inch for the entire country. The general average was exceeded in 15 counties, equalled in 2, but not reached in 35. Devonshire was in the first group, its wet-day rate being ·26 inch.

The principal facts connected with the wet-day rates of rain during the last four years are shown below:—

TABLE XVI.

		1868. inch.	1869. inch.	1870. inch.	1871. inch.
Greatest mean wet-day rate of rain in any county . . .		.38 ^a	.42 ^b	.42 ^c	.33 ^g
Least do. do. . .		.14 ^d	.16 ^e	.12 ^f	.14 ^f
General do. . .		.22	.22	.21	.21
Devonshire do. . .		.25	.23	.22	.26

^a, Cumberland. ^b, Merionethshire. ^c, Montgomeryshire. ^d, Suffolk. ^e, Cambridge and Bedford shires. ^f, Cheshire. ^g, Cumberland and Brecknockshire.

The tenth and two succeeding columns, Table XIII., show for each county the average annual rainfall, number of wet days, and wet-day rate of rain, during the six years ending with December 31st, 1872.

On comparing them with the seventh, eighth, and ninth columns, the following facts present themselves :—

1st. That the mean annual rainfall in 1871 was below the average in 27 counties, above it in 24, and equal to it in 1 (Bedfordshire); and that it was below the average in the country as a whole, the defect being 1.03 inch.

2nd. That the mean annual number of wet days in 1871 was below the average in 35 counties, above it in 13, and equal to it in 4; and that it was below the average in the country as a whole, the defect being 1 day.

3rd. That the mean annual wet-day rate of rain in 1871 was below the average in 19 counties, above it in 21, and equal to it in 12; and that it was equal to the average in the country as a whole.

The principal average rainfall statistics during the six years are shown below :—

TABLE XVII.

	Periods in Years.				
	2 1866-7	3 1866-8	4 1866-9	5 1866-70	6 1866-71
Greatest average annual rainfall in any county in inches	66·73 ^a	68·77 ^a	68·91 ^a	66·47 ^b	65·39 ^b
Least average annual rainfall in any county in inches	23·20 ^c	22·53 ^c	22·35 ^c	20·04 ^d	20·26 ^d
Mean average annual rainfall per county in inches	35·77	35·34	35·37	33·53	33·33
Devonshire average annual rainfall in inches	44·01	43·92	42·77	39·41	39·83
Greatest average annual number of wet days in any county	223 ^b	216 ^b	207 ^b	197 ^b	197 ^b
Least average annual number of wet days in any county	143 ^e	137 ^c	137 ^c	132 ^c	130 ^c
Mean average annual number of wet days per county	183	171	169	160	159
Devonshire average annual number of wet days	194	187	182	170	169
Greatest average annual wet-day rate of rain in any county in inc.	34 ^e	35 ^a	36 ^f	37 ^g	36 ^g
Least average annual wet-day rate of rain in any county in inch.	14 ^h	14 ^h	15 ^h	14 ⁱ	14 ^h
Mean average annual wet-day rate of rain per county in inches	20	21	21	21	21
Devonshire average annual wet-day rate of rain in inches	23	23	23	23	24

^a, Cumberland. ^b, Merionethshire. ^c, Bedfordshire. ^d, Huntingdonshire. ^e, Cumberland and Westmoreland. ^f, Cumberland and Montgomeryshire. ^g, Montgomeryshire. ^h, Cambridgeshire. ⁱ, Huntingdon and Cambridge shires.

The numerals in the last or right column of Table XIII. show the order in which the counties stand in respect to their average annual rainfalls during the six years, or, what amounts to the same thing, their aggregate rainfalls during the entire period. Thus during the six years ending with 1871, the average aggregate rainfall at every station in Merionethshire amounted to 392·34 inches, giving a mean fall of 65·39 inches per year; and so on for the other counties. As may be expected, this order undergoes some fluctuation from year to year. The changes of this kind, with regard to the *wet* counties of England and Wales, are shown below, where the numerals in the successive columns show the order at the end of the two, three, four, five, and six years:—

TABLE XVIII.

	Periods in Years.				
	2 1866-7	3 1866-8	4 1866-9	5 1866-70	6 1866-71
Cumberland	1	1	1	2	3
Westmoreland	2	2	3	3	2
Merionethshire	3	3	2	1	1
Montgomeryshire	4	4	4	4	4
Carnarvonshire	5	5	5	5	5
Cardiganshire	6	6	6	6	11
Cornwall	7	7	7	9	9
Pembrokeshire	8	8	8	11	10
Monmouthshire	9	9	9	8	8
Lancashire	10	13	12	12	12
Glamorganshire	11	10	10	7	6
Carmarthenshire	12	11	11	10	7
Devonshire	13	12	13	15	14
Radnorshire	14	14	15	14	15
Derbyshire	15	16	17	18	18
Brecknockshire	16	15	14	13	13
Anglesea	17	17	16	17	17
Cheshire	18	..	..	16	16
Yorkshire	19	..	..	19	19
Dorsetshire . . . .	..	18	..	..	..
Somersetshire . . . .	..	..	18	..	..

An inspection of the list shows the following facts :—

1st. The *wet* counties include all those which, with the exception of Flint and Denbigh shires, form the western coast of Britain, from the Solway Frith to the Land's End, and occasionally to Dorsetshire, together with a few inland counties characterized by great elevation.

2nd. Neither Flintshire nor Denbighshire has ever been in the wet list, but all the other Welsh counties belong permanently to it.

3rd. Cumberland, Westmoreland, Merionethshire, Montgomeryshire, and Carnarvonshire have always been at the head of the list, but not always in the same order.

4th. Montgomeryshire and Carnarvonshire have always been respectively the fourth and fifth amongst the wet counties.

5th. Cumberland, Westmoreland, Monmouthshire, Radnorshire, and Anglesea have fluctuated but little in their places in the list.

Devonshire and the other South-western Counties :—

The *relative* annual rainfalls, number of wet days, and wet-day rates of rain in the five south-western counties, during the six years ending with December 31st, 1871, are shown below :—

TABLE XIX.

	Rainfalls.	Wet days.	Wet-day Rates.
Cornwall . . .	100	100	100
Devonshire . . .	90	94	96
Somersetshire . . .	75	87	84
Dorsetshire . . .	73	85	84
Wiltshire . . .	64	88	72

Recapitulation :— The following summary will serve to show the position of Devonshire amongst the counties of England and Wales with regard to rainfall.

In 1871, six counties surpassed it in their number of gauges in relation to area, forty-five in having their gauges nearer to the surface of the ground on the average, and thirty in having their stations at a less average height above the sea level.

Its average rainfall (41.92 inches) was 30 per cent. above the average for the entire country, 36 per cent. below that for the wettest county, 102.5 per cent. above that for the driest, and there were 12 counties in which the average fall was greater.

Its average number of wet days (164) was 4 per cent. above that for the entire country, 18 per cent. below the greatest county number, 66 per cent. above the least, and there were 16 counties in which the number was greater.

Its average wet-day rate of rain (26 inch) was 24 per cent. above the average for the entire country, 28 per cent. below the greatest county rate, 86 per cent. above the least, and there were 9 counties in which the rate was greater.

During the six years ending with December 31st, 1871, its average annual rainfall (39.83 inches) was 19.5 per cent. above that for the entire country, 39 per cent. below that for the wettest county, 96.5 per cent. above that for the driest,

and there were 13 counties in which the average yearly rainfall was greater.

Its average yearly number of wet days (169) was 6 per cent. above that for the entire country, 14 per cent. below the greatest county number, 30 per cent. above the least, and there were 10 counties in which the number was greater.

Its mean wet-day rate of rain (.24 inch) was 14 per cent. above that for the entire country, 33 per cent. below the greatest county rate, 71 per cent. above the least, and there were 11 counties in which the rate was greater.

Its average yearly rainfall, number of wet days, and wet-day rate of rain exceeded those in each of the four other "South-western" counties, with the exception of Cornwall only, which in each case stood at the head of the list.

SEVEN YEARS' METEOROLOGY OF SIDMOUTH, 1865-1871.

BY J. INGLBY MACKENZIE, M.B. CANTAB., M.R.C.S., ETC.

Fellow of the English and Scottish Meteorological Societies.

(Read at Exeter, July, 1872.)

As the Devonshire Association proposes to visit Sidmouth at their next Meeting, it appeared to me that some information about the locality to which the steps of the members next year will be turned would not be unacceptable—though, except a passing description, I shall not venture to trespass on the ground which will be admirably described by those who have made the sciences of geology, botany, archaeology, the subjects of their study for years in Sidmouth—still, in the path of meteorology, I may venture to anticipate.

Sidmouth is situated at nearly the centre of the great bay said to be by some, and believed to be by other authorities, hollowed out by the action of the eastern portion of the Gulf Stream. Its latitude is $50^{\circ} 40' 40''$ N. Longitude, $3^{\circ} 13' 3''$ W. The arms of the bay referred to are formed by Portland on the east, and Berry Head on the west. The valley, on the sea-face of which Sidmouth is situate, is almost entirely land-locked, being sheltered both on the east and west by lofty hills of an altitude of about 500 feet, the inlets to the valley from the land side being by the windings of the valley through well wooded avenues of trees, giving the town proper the greatest possible amount of shelter, whilst the suburbs consist of pretty villas sparsely dropped amidst groves of luxuriant foliage. Nature has apparently endeavoured to produce a combination of circumstances such as would render the climate most equable without the additional one above referred to, of the water of the Gulf Stream reaching our bay. This circumstance, though placed to the credit of the warm climate of Sidmouth many years since, has found many disbelievers, though it has been supported of late years by no less an authority than Mr. Buchan, the Secretary of the Scottish

Meteorological Society. Assuming such an hypothesis to be correct—an hypothesis equally difficult to verify as to discredit—we have one reason for explaining the equability of the climate of Sidmouth, because water is of an exceedingly even temperature, is slow to part with its heat, and varies but little during the year. If, then, this comparatively warmer current is continually approaching our shore, keeping the sea in our vicinity at a warmer temperature, its vapour must necessarily tend to render the air in its close proximity warmer than the air further inland. This would be the case specially in winter, its converse in summer.

The science of Meteorology, though undoubtedly one of the most ancient of studies, is but yet in its infancy, and the minimum amount of knowledge of it possessed by persons who in other branches of science profess to be learned is oftentimes astonishing, more especially in a country where the first remark usually made in conversation has reference to the weather. It appears that many persons are not cognisant of the fact, that their personal sensations are not necessarily correct as to the state of the temperature, the moisture of the air, &c.; for these sensations must vary with the state of the individual's health at the time. A simple example of this—the sensation of cold and shivering experienced by persons suffering from a cold even in the hottest day of summer, and the converse in case of intermittent fever and ague; many circumstances rendering us physically more susceptible of cold and heat than we should be were our bodies formed of less sensitive materials. An increase of moisture in the air will soon make itself sensible to one who has had the misfortune to suffer from rheumatism or disease of the joints, without alluding to that very domestic but truthful hygrometer referred to by old ladies—their corns.

Consequently in our own persons we are unable to give correct opinions on the heat or cold of the weather, and we are of necessity compelled to seek a substance which will indicate the variations of heat and cold truthfully: this substance has been found in mercury (sometimes proof-spirit).

In making comparisons of the temperature of different places, it is necessary, to avoid falling into error, that the observations whence these comparisons are educed should be taken at similar hours of the day—should extend over the *same* period of years—should be taken with instruments, if not similar in construction, at any rate compared with a standard by which the instrumental errors may be corrected—and lastly, that they should be placed as nearly as possible

under similar circumstances as to position, exposure, shelter, height above the ground, without any reference to corrections for diurnal range, which are frequently adopted.

It will clearly be seen that variation in any one of these cases will vitiate the correctness of the comparison. The comparison of the temperature of two places during two different periods of years would not give a fair result—one series might have been a cold or wet series; the other, on the contrary, warm and dry. Again, unless the corrections are applied to the instruments which render their readings similar to the Kew or Greenwich standards, there would be again a great variation and source of error. Then, as to position, the British Meteorological Society has suggested that the instruments should be placed on a stand (of which there are several forms, which have been figured in Symons's *Meteorological Magazine*) facing north, four feet from the ground, as far distant as possible from houses, walls, or any object capable of radiating heat, and so placed that air may pass freely round and about them. The bulbs of the instruments to be four feet above the ground.

Any variation from these directions would render observations taken unreliable at any rate for purposes of comparison.

The instruments from which the observations were taken which form the substance of the following tables are placed as nearly as possible in accordance with the suggestions above referred to. The thermometers are affixed to a Glaisher stand, modified by my addition of a Louvre shutter, which drops down over the instruments at a distance of 16 inches, which shelters them from oblique drops of rain and exposure to the horizon.

The position in which the stand is placed has been personally approved by Mr. Glaisher.

To obviate error, all the thermometer observations are taken in duplicate.

Barometer by Adie, verified at Kew, 30 feet above sea level.

Hygrometer, by Casella, verified by Glaisher.

Hygrometer, by Burrow, verified at Kew.

Maximum Thermometer, by Negretti, verified at Kew.

Minimum Thermometer, by Negretti, verified at Kew.

Maximum Thermometer, by Burrow, verified at Kew.

Minimum Thermometer, by Burrow, verified at Kew.

Rain-gauge (Howard's), by Casella, 26 feet above sea level.

Rain-gauge (Howard's), by Burrow, 26 feet above sea level, verified by Symons.

BAROMETER READINGS (MEAN READING IN EVERY MONTH), 1865-71.

Corrected for Instrumental Errors, Temperature, and Height above Sea level.

Month.	1865	1866	1867	1868	1869	1870	1871	Means.
January	29'653	30'059	29'840	29'777	29'975	29'997	29'802	29'864
February	29'915	29'922	30'147	30'189	29'867	29'858	30'042	29'948
March	29'950	29'508	30'007	30'024	29'855	30'035	30'060	29'919
April	30'083	29'887	29'730	29'967	30'026	30'164	29'862	29'959
May	29'951	30'015	29'878	30'033	29'798	30'052	30'097	29'975
June	30'184	29'946	30'163	30'189	30'127	30'180	29'944	30'104
July	30'021	29'995	29'753	30'035	30'133	30'015	29'882	29'976
August	29'947	29'796	30'040	29'898	30'165	30'014	30'044	29'983
September	30'201	29'745	30'098	29'825	29'821	30'088	30'049	29'975
October	29'662	30'076	29'995	30'135	30'091	29'736	29'946	29'948
November	29'885	30'013	30'350	30'027	30'014	29'825	30'016	30'018
December	30'206	30'033	29'390	29'099	29'828	29'877	30'141	29'939
	29'955	29'938	30'008	29'937	29'975	29'978	29'907	29'960

2 D 2

The average reading for seven years is 29'960.

The lowest average is in the month of December, 1868.

The highest average is in the month of November, 1867.

The year 1867 had the highest average.

The year 1871 had the lowest average.

The month of June averaged highest.

The " of January averaged lowest.

The range between their extremes was 0'240.

COMPARISON OF THE MEAN TEMPERATURE OF GREENWICH AND SIDMOUTH
DURING THE YEARS 1865-1871.

	1865			1866			1867			1868			1869			1870			1871			G. s. Average.	
	G.	s.	G.	s.	G.	s.	G.	s.															
January	36.3	37.8	42.6	44.4	34.2	37.3	37.2	40.4	41.1	45.8	38.3	42.6	33.2	36.6	37.5	40.7							
February	36.6	39.7	40.5	42.2	44.7	46.2	43.0	44.2	45.3	47.1	36.2	39.9	42.4	44.0	41.2	43.3							
March	36.6	38.9	40.5	41.6	37.7	38.8	44.0	46.1	37.5	40.6	39.6	44.0	44.9	44.6	40.1	42.1							
April	52.3	51.5	47.9	47.8	49.0	49.2	48.1	47.7	50.3	48.7	48.9	46.2	47.7	49.1	49.1	48.3							
May	56.1	53.3	50.1	49.2	53.4	51.6	57.3	53.7	50.5	50.1	53.4	50.6	51.9	51.0	53.2	51.3							
June	60.2	60.7	60.9	57.6	58.1	57.1	62.0	57.0	55.3	54.3	60.9	57.1	54.8	54.4	58.8	56.9							
July	63.8	61.8	61.0	60.0	59.4	59.2	67.5	64.0	62.0	60.3	65.4	62.2	61.7	58.5	62.9	60.8							
August	59.9	59.1	59.4	58.5	62.0	60.3	63.6	60.4	60.2	59.1	61.1	60.5	64.8	61.6	61.5	59.9							
September	63.9	62.0	56.4	57.0	57.6	56.9	60.5	58.9	58.2	57.9	55.7	57.4	57.4	56.0	58.4	58.0							
October	59.9	54.1	51.3	53.0	48.7	51.5	47.9	49.8	48.9	50.9	49.8	52.1	49.4	52.6	49.5	52.0							
November	44.8	47.3	44.3	48.1	41.1	43.4	41.5	44.2	43.0	46.1	41.5	43.5	37.6	41.7	41.9	44.9							
December	42.4	44.7	42.9	46.9	37.5	40.8	46.0	48.6	37.9	39.8	33.6	35.8	38.3	39.9	39.8	42.3							
Mean of Year	50.3	50.9	49.8	50.5	48.6	49.3	51.5	51.2	49.2	50.0	48.7	49.3	48.6	49.1	49.4	50.0							

The result of this Table is to show that the annual mean temperature of Sidmouth and Greenwich are within about half a degree of each other; but it likewise indicates that though such is the case, Sidmouth is warmer in the winter and cooler in the summer months than Greenwich, proving thereby *its equality of temperature*; for whilst London exceeds Sidmouth in temperature in the six summer months by $0.8 - 1.9 - 2^{\circ}.4 - 2^{\circ}.1 - 1^{\circ}.6$ —and $0^{\circ}.4$ —Sidmouth is warmer than London by $2^{\circ}.8$ in January, $2^{\circ}.1$ in February, $2^{\circ}.5$ in March, $2^{\circ}.1$ in October, $3^{\circ}.0$ in November, $2^{\circ}.5$ in December.

MEAN DAILY RANGE OF TEMPERATURE.

Month.	1865	1866	1867	1868	1869	1870	1871	Average of each Month.
January	11°0	12°5	11°7	11°2	10°9	9°9	8°3	10°8
February	10°3	13°2	11°7	12°3	10°3	10°9	8°8	11°0
March	10°1	12°0	10°5	13°1	13°6	12°3	9°9	11°6
April	13°9	12°5	13°3	15°2	14°4	16°8	10°2	13°7
May	12°5	17°2	13°5	15°9	11°8	15°3	14°8	14°4
June	17°0	14°7	16°7	18°4	17°0	17°0	14°2	16°4
July	13°4	16°0	17°6	18°7	15°6	16.9	11°6	15°7
August	12°9	14°3	16°6	13°7	17°0	15°8	14°5	14°9
September	14°5	12°7	15°7	14°4	11°7	14°9	12°4	13°7
October	13°1	11°4	13°7	16°5	12°4	13°7	8°8	12°8
November	12°7	12°4	13°2	10°5	13°0	12°2	8°9	11°9
December	11°1	12°4	12°1	10°5	10°7	9°5	11°9	11°1
Mean daily range of each year...}	12°7	13°4	13°8	14°2	13°2	13°7	11°1	

Mean daily range for the seven years, 13°2.

From this Table it will be perceived that the mean daily range for the septennial period referred to is 13°2.

That the greatest mean daily range occurred in the month of June, 16°4.

That the least mean daily range occurred in the month of January, 10°8.

The largest daily range was in July, 1868—viz., 18°7.

The smallest daily range was in January, 1871—viz., 8°3.

That the year 1871 had the smallest average daily range, 11°1.

That the year 1868 had the largest average daily range, 14°2.

That the average daily range of six winter months was 11°5.

That the average daily range of six summer months was 14°8.

BAROMETRIC RANGE, 1865-1872.

	1865.			1866.			1867.			1868.			1869.			1870.			1871.		
	H.	L.	R.	H.	L.	R.	H.	L.	R.	H.	L.	R.	H.	L.	R.	H.	L.	R.	H.	L.	R.
n.	30°400	28.880	1.520	30°709	28.969	1.740	30°193	28.919	1.274	30°466	29.016	1.450	30°498	28.866	1.632	30°604	29.170	1.434	30°292	28.884	1.408
b.	30°570	29.010	1.560	30°361	28.780	1.381	30°678	29.056	1.622	30°618	29.371	1.247	30°494	28.974	1.520	30°332	29.444	0.886	30°534	29.324	1.210
ar.	30°370	29.360	1.010	30°435	29.041	1.394	30°731	29.281	1.450	30°583	29.320	1.265	30°322	29.278	1.014	30°504	29.480	1.024	30°532	29.474	1.058
apr.	30°360	29.820	0.540	30°404	29.268	1.136	30°501	29.150	1.351	30°393	29.064	1.329	30°354	29.304	1.050	30°564	29.504	1.060	30°216	29.204	1.012
May	30°380	29.650	0.730	30°398	29.528	0.870	30°199	29.139	1.060	3°0339	29.476	0.863	30°254	29.188	1.066	30°411	29.317	1.094	30°484	29.880	0.604
June	30°470	29.430	1.040	30°287	29.478	0.809	30°591	29.727	0.864	3°0349	29.660	0.689	30°384	29.624	0.760	30°626	29.871	0.755	30°348	29.608	0.740
July	30°401	29.380	0.521	30°400	29.392	1.008	30°317	29.308	1.009	30°374	29.746	0.628	30°524	29.804	0.720	30°394	29.762	0.632	30°314	29.562	0.752
ig.	30°285	29.452	0.833	30°145	29.446	0.699	30°236	29.709	0.527	30°321	29.314	1.007	30°544	29.818	0.726	30°392	29.676	0.716	30°394	29.454	1.130
pt.	30°491	30.067	0.424	30°090	29.253	0.847	30°546	29.739	0.807	30°318	29.138	1.180	30°496	29.324	1.172	30°586	29.421	1.165	30°316	29.025	1.391
f.	30°232	29.256	0.976	30°498	29.717	0.781	30°487	29.502	0.985	30°333	29.459	0.874	30°574	29.444	1.130	30°578	29.034	1.544	30°504	29.274	1.230
iv.	30°388	28.858	1.530	30°394	29.475	1.219	30°682	29.470	1.212	30°642	28.995	1.647	30°560	29.250	1.310	30°654	29.211	1.443	30°426	29.588	0.838
e.	30°389	28.897	1.912	30°506	29.377	1.129	30°413	28.908	1.505	30°243	28.786	1.457	30°520	29.284	1.236	30°634	29.074	1.560	30°578	29.282	1.296

From this Table we learn that in three years, '66, '69, '71, the greatest range was in the month of January. The least range in three years, '68, '70, was in July. The highest barometer reading was 30°709, on January 25th, 1866. The lowest barometer reading was 28°780, on February 11th, 1866; giving an extreme barometric range of 1.928. The greatest range in any month was 1.740, in January, 1866; the least in February, 1866, 0.424.

RAINFALL, 1865-1871.

Average fall on each Rainy Day = .17.

Annual number of Rainy Days, 169.

Annual Average 31·44

RAINFALL.

From this Table it appears that the average rainfall is about $31\frac{1}{2}$ inches, and the number of rainy days 169. The comparison of the Sidmouth rainfall with that of other places in Devonshire and elsewhere has been made with so much accuracy by Mr. Pen-gelly, F.R.S., that I should be trespassing on his speciality were I to allude to it further than to state that the rainfall at Sidmouth is one of the smallest in Devonshire, as also is the quantity of rain which falls on each rainy day.

(A rainy day = a day on which more than .01 inch is measured.)

Referring again to the Table, it will be perceived the month of September has the largest annual rainfall—spite of the fact that no rain fell in 1865 in that month—and June has the least. June has also the least number of rainy days; February and October being equal for the largest, 18.

The largest fall in any month was 8.87 inches in September, 1866, following, curiously, the smallest fall in the September of the previous year; viz., zero.

Necessarily the smallest number of rainy days was in September, 1866; the greatest number of rainy days in any month was in December, 1868; viz., 31.

The average fall on each rainy day in seven years was .17, and this average has gradually decreased in each year from .22 to .13.

DEGREE OF HUMIDITY

CALCULATED BY GLAISHER'S HYGROMETRICAL TABLES (3RD EDITION).

	1865	1866	1867	1868	1869	1870	1871	Average.
January	87	83	80	92	86	81	84	84
February	80	80	88	76	86	90	93	84
March	79	87	84	78	79	78	85	81
April	84	77	87	85	84	82	79	83
May	80	72	82	85	87	89	76	81
June	78	85	78	69	83	78	79	78
July	77	77	79	64	83	78	76	76
August	83	71	84	72	74	73	81	77
September	84	75	84	78	74	76	92	80
October	87	85	83	88	86	83	90	86
November	82	76	76	78	87	85	87	81
December	83	86	87	85	85	90	91	86
Mean Degree of } Humidity ... }	82	80	82	79	82	81	84	81

Mean of six Winter Months, 82.

Do. Summer do. 79.

The deductions from this Table are that saturation = 100, the relative degree of Humidity of Sidmouth is 81. This, considering the proximity to the sea, is not by any means excessive, and approaches very nearly to the amount affirmed by Dr. Parkes to be most agreeable to healthy persons, and is at the same time sufficiently moist to allay cough. He adds, " Warmth and humidity are better borne than cold and humidity." (Dr. Parke's *Practical Hygiene*.)

The average of the six Winter Months is 83.

Do. six Summer do. is 79.

October and December are rivals for the highest degree of humidity. July has the lowest.

The year 1871 has the highest, 1868 the lowest degree.

MONTHLY EXTREME RANGE OF TEMPERATURE.

	1865.			1866.			1867.			1868.			1869.			1870.			1871.		
	H.	L.	R.	H.	L.	R.	H.	L.	R.	H.	L.	R.	H.	L.	R.	H.	L.	R.	H.	L.	R.
Jan.	52.2	23.2	29.0	56.6	27.7	28.9	57.5	16.6	40.9	54.5	25.5	29.0	55.9	30.0	25.9	53.6	26.3	27.3	48.4	23.3	25.1
Feb.	52.7	26.5	35.5	57.5	28.5	29.5	57.0	30.6	26.4	57.0	28.4	28.6	57.0	32.7	24.0	50.9	21.6	29.5	56.2	29.4	26.8
Mar.	51.0	25.7	25.3	59.5	27.2	32.3	56.6	28.0	27.6	59.0	30.0	29.0	54.6	29.0	25.6	57.8	25.4	32.4	61.0	30.8	30.2
April	72.2	33.0	39.2	64.6	35.3	29.3	61.3	36.4	24.9	65.3	29.4	35.9	71.5	34.0	36.5	64.6	27.5	37.1	60.5	32.3	28.2
May	66.7	36.0	30.7	65.8	32.8	33.0	73.4	34.2	39.2	72.5	36.6	35.9	61.0	36.6	24.4	68.6	34.0	34.6	72.7	36.3	36.4
June	80.5	45.6	35.5	81.8	44.4	37.4	77.8	45.1	32.7	75.0	42.0	33.0	73.0	43.5	29.5	77.5	44.0	33.5	68.7	38.0	30.7
July	75.5	48.6	26.9	79.0	45.3	33.7	73.4	44.2	29.2	80.2	52.0	28.2	79.0	46.8	32.2	79.9	46.0	33.9	73.6	46.0	27.6
Aug.	69.8	44.7	25.1	72.2	45.6	26.6	78.5	45.4	33.1	77.6	47.5	30.1	78.7	45.5	33.2	79.7	44.2	35.5	80.7	46.0	34.7
Sep.	73.6	47.8	25.8	69.0	40.0	28.7	72.0	38.3	34.7	74.0	46.3	27.7	69.0	44.4	24.6	70.5	42.0	28.5	70.9	38.4	32.5
Oct.	70.7	34.9	35.8	66.0	35.8	30.2	63.0	33.5	29.5	63.7	33.0	30.7	68.5	31.7	26.8	66.6	33.3	33.3	61.0	39.3	31.7
Nov.	58.2	31.8	26.4	61.0	29.0	32.0	62.4	27.4	32.0	58.0	29.5	28.5	60.0	28.8	31.2	56.6	28.6	27.0	54.3	25.5	28.8
Dec.	56.1	28.1	28.0	59.0	30.7	28.3	57.7	25.6	32.1	59.4	33.6	23.8	57.0	21.5	35.5	54.8	19.4	35.4	51.0	23.9	27.1
Mean in each year	...	...	29.5	...	...	30.8	...	...	32.1	...	...	30.0	...	...	29.0	...	...	32.3	...	29.9	

Mean of seven years, 30.4.
Greatest range in January, 1867.

This Table shows the highest and lowest readings of the self-registering thermometers during the seven years, with the extreme range. The average extreme range for 1865-1871 = 30°.4.

The greatest range was in the month of January, 1867—viz., 40°.9.

The least range was in the month of December, 1868—viz., 23°.8.

The highest reading of thermometer was in June, 1866—viz., 81°.8.

The lowest reading of thermometer was in January, 1867—viz., 16°.6.

On four occasions only has the thermometer exceeded 80°.

On two occasions only has the thermometer read below 20°—viz., in January, 1867, as above, and in December, 1870, when it read 19°.4.

SUMMARY OF RESULTS.

The Mean reading of Barometer for seven years	29.960 inches.
The Highest reading of do. was on January 25th, 1866	30.709 "
The Lowest reading of do. was on February 11th, 1866	28.780 "
The extreme Range in same period	1.929 "
Highest Temperature	81.8 "
Lowest do.	16.6 "
Extreme Range of Temperature in 7 years	65.2 "
Mean Temperature	50.0 "
Mean daily Range of Temperature	13.2 "
Mean daily Range of Temperature six winter months	11.5 "
Mean daily Range of Temperature six summer months	14.8 "
Extreme Range (average seven years)	30.4 "
Average Annual Rainfall	31.44 "
Do. do. No. of Rainy Days	169 days.
Fall on each Rainy Day	0.17 "
Degree of Humidity (annual)	81 "
Do. Summer months	79 "
Do. Winter months	83 "

Conclusions drawn are—

1. The great equability of temperature, that is, the small range of temperature compared with other places.
2. The small quantity of rainfall, as compared with other places in the neighbourhood, and the small quantity which falls on each rainy day, and therefore its comparative dryness.

SUPPLEMENTARY LIST OF WORKS ON THE GEOLOGY, MINERALOGY, AND PALÆONTOLOGY OF DEVONSHIRE.

BY WILLIAM WHITAKER, B.A. (LOND.).

OF THE GEOLOGICAL SURVEY OF ENGLAND.

(Communicated by W. PENGELEY, F.R.S. Read at Exeter, July, 1872.)

Though but two years have passed since the former list was sent to the Devonshire Association, yet the titles of more than a hundred additional papers, &c., have accumulated, of which over eighty were published before that list was written. This amount of material justifies the sending of a supplement, which refers to eighty-one authors, fifty of whom were not noticed in the original list.

I have to thank Messrs. T. M. HALL and W. PENGELEY for calling my attention to some papers that had escaped my notice.

CORRECTIONS, &c., TO FORMER LIST (1870).

- Index. Under "Lankester," for 267 read 257.
No. 3. POLWHELE, Rev. R. *The History of Devonshire*, vol. i. Springs, &c.
p. 16. Soil, Stone, Fossils, &c., pp. 40-81. Mining, p. 158.
Folio. London.
No. 4. Also in *Journ. Nat. Phil. Chem. and Arts* (4to), vol. ii. pp. 201, 208.
No. 14. THOMSON (not THOMPSON).
No. 30. For "Iron" read "Tin." Also in *Phil. Mag.*, vol. lix. p. 417. (1822.)
No. 52. Also in *Edin. New Phil. Journ.*, vol. iii. p. 374.
No. 120. Should come under the year 1843.
No. 133. Reprinted (nearly in full) in *Edin. New Phil. Journ.*, vol. i. p. 235.
(Kent's Hole, pp. 248, 9.)
No. 141. Apparently an abstract of No. 50 of the following list.
No. 146. (?) should come under the year 1856.
No. 147. Should be erased, the work containing nothing geological.
No. 161. Add, "and *Trans. Roy. Geol. Soc. Cornwall*, vol. vii. p. 388.
No. 167. Should come under the year 1863.
No. 170. Should come under the year 1863. For "Tracy" read "Tracey."
No. 172. Also in *Trans. Roy. Geol. Soc. Cornwall*, vol. vii. p. 441.
No. 177. Also in *Trans. Roy. Geol. Soc. Cornwall*, vol. vii. p. 419.
No. 274. For vol. vii. read vol. ii. part 2.
No. 296. FRASER, R. General View of the County of Devon. (Map, and
Account of Soils and Mines.) 4to. London. 1794.
No. 297. Add, "8vo. London. Reprinted in 1813. (Map, and Account of
Soils and Minerals.)"
No. 298. LYSONS, Rev. D., and S. *Magna Britannia*. Vol. vi. Devonshire.
(Soils, Strata, &c., chiefly by J. HAWKINS, pp. ccxxxii.-ccli.
Minerals, pp. cclxv -cclxx. Organic Remains, pp. cclxx.-cclxiii.
Mineral Springs, &c., p. cclxxv.) 4to. London.
No. 299. SHAPTER, T. The Climate of the South of Devon, and its
Influence upon Health, &c. Geological Map, and a chapter on
the Geology, &c., pp. 161-207. 8vo. London. 1842. Second
edition in 1862. Geology, &c., chap. ii., pp. 61-98.

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1732. (?)

1. ATWELL, J. Conjectures upon the Nature of Intermittent Springs (Brixham). *Phil. Trans.*, vol. xxxvii. p. 301.

1745.

2. HUXHAM, DR. J. A Letter serving to accompany a Present of a beautiful Stalactites (from Cat-down, near Plymouth). *Phil. Trans.*, vol. xlili. (No. 474), p. 207.

1761.

3. MILLES, DR. J. Remarks on the Bovey Coal. *Phil. Trans.*, vol. li. pp. 534, 941.

1794.

No. 296 of the former list should have been entered under this year. (See corrections.)

1804.

4. HATCHETT, C. Observations on the Change of some of the proximate Principles of Vegetables into Bitumen; with analytical Experiments on a peculiar Substance which is found with the Bovey Coal. *Phil. Trans.*, vol. xcv. p. 385. Reprinted in *Phil. Mag.*, vol. xxi. pp. 40, 147—(1805), and in *Jour. Nat. Phil. Chem. and Arts.*, ser. 2, vol. x. p. 181.

1805.

5. DAVY, [SIR] H. An Account of some analytical Experiments on a mineral Production from Devonshire, consisting principally of Alumine and Water [Wavelite from Barnstaple]. *Phil. Trans.*, vol. xcv. p. 155. Reprinted in *Phil. Mag.*, vol. xxii. p. 35; and in *Journ. Nat. Phil. Chem. and Arts.*, ser. 2, vol. xi. p. 153; and in his "Collected Works," vol. ii. p. 297. 8vo. London, 1839.

1808.

No. 297 of the former list should have been entered under this year. (See corrections.)

1809.

6. BRITTON, J., & E. W. BRAYLEY. The Beauties of England and Wales, vol. iv. (Notice of the Minerals, &c., of Devonshire, pp. 26–42.) 8vo. London.

1810.

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Drawings of the plans and sections of some Devonshire Mines have been placed in the Mining Record Office, at the Geological Museum, Jermyn Street, London.

THE SIGNS OF THE HOTELS, TAVERNS, INNS, WINE-AND-SPIRIT-VAULTS, AND BEERSHOPS IN DEVONSHIRE.

BY W. PENGELLY, F.R.S., ETC.

(Read at Exeter, July, 1872.)

SIGNBOARDS can by no means be pronounced failures, inasmuch as, in attracting a large share of attention, they have achieved the object for which they were intended.

About one hundred and sixty years ago, Addison, in an amusing letter to the *Spectator*,* called attention to the "absurdities hung out upon the sign-posts" of London, and complained that the streets were "filled with blue boars, black swans, and red lions; not to mention flying pigs, and hogs in armour, with many other creatures more extraordinary than any in the deserts of Afric."

He professed himself desirous of the office of superintendent of all such figures and devices, with full powers to expunge whatever he should find irregular or defective; and he regarded the following as the tasks of such an officer:—

First, like Hercules, to cleanse the city of monsters.

Second, to forbid that creatures of jarring and incongruous natures should be joined together in the same sign; such as the bell and the neat's tongue, the dog and the gridiron. The fox and the goose, he said, might be supposed to have met; but what had the fox and the seven stars to do together? And when did the lamb and dolphin ever meet except upon a sign-post? As for the cat and fiddle, there was a conceit in it; and therefore he did not intend that any thing he had said should affect it.

Third, to enjoin every shop to make use of a sign which bore some affinity in the wares in which it dealt. He thought it inconsistent to see a tailor at the lion, a cook at the boot, or a shoemaker at the roasted pig; and he complained of

* No. 28, Monday, April 2, 1711.

having seen a goat set up before the door of a perfumer, and the French king's head at a sword cutler's.

Fourth, when occasion offered, to advise the owners to let their sign-posts inform the world who they were. He commended Mrs. Salmon, who, instead of living at the sign of the trout, had erected before her house the figure of the fish that was her namesake.

Many short articles have been written on the subject since Addison's letter, but it was not until very lately that a general History of Signboards was published in this country.* This is the more to be regretted as it cannot be doubted that many remarkable signs have passed away unrecorded.

The perusal of the work just spoken of has caused me to carry out a long-cherished intention of making a complete list of the Signs of the hotels, taverns, inns, wine and spirit-vaults, and beer-houses at present existing in this county. The labour has vastly exceeded what had been anticipated, but the list is now complete, and I venture to solicit a place for it in the *Transactions* of our Association.

Though the work has, indeed, been very considerable, it has been much diminished by the recent change in the law causing beer-shop licenses, as well as those of "alehouses," to be granted by the magistrates, instead of by the excise officers as formerly.

The collection of the names of the signs has been thus reduced to the simple act of writing to the *Clerks to the Justices* in each "Division" and Municipal Borough in the county, requesting the favour of a list of the Signs of all the houses, in each parish separately, for which licenses were applied for at the last Brewster Sessions. Such an application was accordingly made towards the close of 1871, and, with one single exception, full replies were promptly and courteously forwarded.

The following, therefore, may be regarded as a trustworthy list of all the houses, having signs, at present licensed to retail alcoholic beverages in every Borough and "Division" in Devonshire, with the single exception of Bideford "Division"—not including the Borough.

In the absence of official information, a list for that "Division" has been compiled from "Morris and Co.'s Commercial Directory and Gazetteer of Devonshire," and though some

* "The History of Signboards from the earliest Times to the present Day." By Jacob Larwood and John Camden Hotten. London, 1866.

alterations may have taken place since the publication of the work in 1870, it is hoped the inaccuracies, if any, are inconsiderable.

Table I. contains the names of all the "Divisions" into which Devonshire is divided for magisterial purposes, and also of the parishes included in each. Those of the latter printed in italics are parishes having no licensed houses known by any Sign. A considerable number of beer-shops in the county have not yet risen to the dignity of a sign board.

The Roman numerals prefixed to each "Division" and Borough are to facilitate reference in Table II.

TABLE I.

Showing the Names of the Magisterial "Divisions" of Devonshire, with their Parishes, &c., and also of the Cities and Boroughs.

Nos.	DIVISIONS.	PARISHES AND TITHINGS.
I.	AXMINSTER	Axminster, Axmouth, <i>Cowypne</i> , Dalwood, Kilmington, Membury, Musbury, Stockland, Uplyme, Colyton, Shute, Seaton, and Beer.
II.	BIDEFORD	Abbotsham, Alwington, Buckland Brewer, <i>Bulkworthy</i> , East Putford, Landcross, Littleham, Monkleigh, Newton St. Petrock, Northam, Parkham, Clovelly, Hartland, <i>Welcombe</i> , Woolfardisworthy, Westleigh.
III.	BRAUNTON	Fremington, <i>Horwood</i> , Instow, Newton Tracey, Tawstock, Ashford, Barnstaple, <i>Berrynarbor</i> , <i>Bittadon</i> , Bratton Fleming, Braunton, Combe Martin, East Down, Georgeham, Goodleigh, Heanton Punchardon, Ilfracombe, Kentisbury, Marwood, Morthoe, Pilton, Trentishoe, West Down, Atherington, Bishopstowton, Landkey, Swimbridge, <i>Arlington</i> , Brendon, Challacombe, Countisbury, <i>Highbray</i> , Linton, Loxhore, Martinhoe, Parracombe, Sherwill, <i>Stoke Rivers</i> .

TABLE I.—*continued.*

Nos.	DIVISIONS.	PARISHES AND TITHINGS.
IV.	CREDITON	Colebrook, Crediton, Kennerleigh, M orchard Bishop, Newton St. Cyres, Sandford, Cheriton Fitzpaine, Poughill, Shobrooke, Stockleigh English, Stockleigh Pomeroy, Upton Hellions, Bow, Clannaborough, Down St. Mary, Zeal Monachorum, Woolfardisworthy.
V.	CROCKERNEWELL	Bridford, Chagford, Cheriton Bishop, Drewsteignton, Dunsford, Gidleigh, Hittesleigh, Southtawton, Spreyton, Tedburn St. Mary, Throwleigh, Lustleigh, Moretonhampstead, North Bovey.
VI.	CULLOMPTON	Bickleigh, Broadhembury, Cadbury, Cadeleigh, Cullompton, Kentisheare, Payhembury, Plymtree, Silverton, Thorverton, Bampton, Burlescombe, Clayhanger, Hockworthy, Holcombe Rogus, Morebath, Uffculme, Butterleigh, Cruwys M orchard, Okeford, Stoodleigh, Templeton, Clayhydon, Culmstock, Hemiock, Calverleigh, Huntsham, Loxbeer, Tiverton Up- lowman, Halberton, Sampford Peverell, Willand, Washfield.
VII.	ERMINGTON and PLYMPTON	Brixton, Plympton Maurice, Plympton St. Mary, Plymstock, Revelstoke, Wembury, Yealmpton, Aveton Gifford, Bigbury, Cornwood, Ermington, Harford, Holbeton, Kingston, Modbury, Newton Ferrers, Ringmore, Ugborough.
VIII.	GREAT TORRINGTON.	Alderdiscott, Great Torrington, Huntshaw, Roborough, St. Giles in the Wood, Beaford, Buckland Filleigh, Frithelstock, Huish, Langtree, Little Torrington, Merton, Peters Marland, Petrockstow, Shebbear, West Gifford, Yarnscombe, Dolton, Dowland.

TABLE I.—*continued.*

NOS.	DIVISIONS.	PARISHES AND TITHINGOS.
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IX.	HATHERLEIGH	<i>Ashbury, Beaworthy, Belston, Broadwoodkelly, Exbourn, Hatherleigh, Highampton, Honeychurch, Jacobstow, Kigbeare Hamlet, Monk Okehampton, North Lew, Sampford Courtenay, Loosebeare Tithe, Idesleigh, Inwardleigh, Meeth, Sheepwash, Okehampton.</i>
X.	HOLSWORTHY	<i>Abbots Bickington, Ashwater, Bradford, East Bridgerule, West Bridgerule, Bradworthy, Black Torrington, Clawton, Cookbury, Halwell, Hollacombe, Holsworthy, Luffincott, Milton Damerel, Northcott Hamlet, Pancrasweek, Pyworthy, Sutcombe, Tetcott, Thornbury, West Putford.</i>
XI.	HONITON	<i>Coombraleigh, Honiton, Luppitt, Shapcombe, Upottery, Yarcombe, Gittisham, Awliscombe, Buckerell, Churchstanton, Dunkeswell, Branscombe, Cotleigh, Farway, Monkton, Northleigh, Offwell, Southleigh, Widworthy, Feniton, Sheldon.</i>
XII.	LIFTON	<i>Bradstone, Bratton Clovelly, Bride-stowe, Broadwoodwidger, Coryton, Dunterton, Germanseweck, Kelly, Lewtrenchard, Lifton, Maristow, Stourton, Stowford, Thrushelton, Virginstow, North Petherwin, St. Giles in the Heath, Werrington.</i>
XIII.	MIDLAND ROBOROUGH	<i>Bickleigh, Buckland Monachorum, Compton Gifford, Egg Buckland, Meavy, St. Budeaux, Sheepstor, Tamerton Foliot, Walkampton, Western Peverell, Shaugh Prior.</i>
XIV.	OTTERY	<i>Aylesbeare, Dotton, Harpford, Newton Poppleford, Rockbeare, Salcombe Regis, Sidmouth, Sidbury, Strete Raleigh, Ven Ottery, Whimple, Tallaton, Ottery St. Mary.</i>

TABLE I.—*continued.*

NOS.	DIVISIONS.	PARISHES AND TITHINGS.
XV.	PAIGNTON	Brixham, Churston Ferrers, <i>Cocking-ton</i> , Kingswear, Marldon, Paignton, St. Mary Church, Stoke Gabriel, Tormoham.
XVI.	ROBOROUGH	Stoke Damerel, East Stonehouse, Vaultershorne.
XVII.	SOUTHMOLTON	Ashreigny, <i>Brushford</i> , Bundleigh, Burrington, Chawleigh, Coldridge, <i>Eggesford</i> , <i>Highbickington</i> , Lapford, North Tawton, <i>Nymett Rowland</i> , Wembworthy, Bishopsnympton, Cheldon, Chulmleigh, <i>Creacombe</i> , <i>Earl Worlington</i> , Kingsnympton, Mariansleigh, Meshaw, <i>Puddington</i> , <i>Rackenford</i> , Romansleigh, Roseash, Thelbridge, <i>Washfordpyne</i> , Witheridge, West Worlington, Winkleigh, <i>East Buckland</i> , <i>Filleigh</i> , West Buckland, Chittlehampton, <i>East Anstey</i> , George Nympton, Knowstone, Molland, Northmolton, Southmolton, Satterleigh, <i>Twitchen</i> , Warkleigh, West Anstey, <i>Charles</i> .
XVIII.	STANBOROUGH and COLERIDGE	Berry Pomeroy, Buckfastleigh, Churchstow, Dartington, Dean Prior, Diptford, East Allington, Kingsbridge, Littlehempston, Loddiswell, Marlborough, Morleigh, <i>North Huish</i> , Rattery, South Brent, South Huish, South Milton, <i>Thurleston</i> , West Alvington, <i>Woodleigh</i> , Ashprington, Blackauton, <i>Buckland Tout Saints</i> , Charleton, Chivelstone, Cornworthy, Dittisham, Dodbrooke, Halwell, Harberton, <i>Portlemouth</i> , South Pool, Sherford, Slapton, Stoke Fleming, Stokenham, Townstall.
XIX.	TAVISTOCK	Brentor, Milton Abbot, Tavistock, Beerferris, Peter Tavy, Sampford Spiney, Whitchurch, Lamerton, Mary Tavy, South Sydenham, Lidford.

TABLE I.—continued.

NOS.	DIVISIONS.	PARISHES AND TITHINGS.
XX.	TEIGNBRIDGE	Abbotskerswell, Broadhempston, <i>Buckland in the Moor</i> , Coffinswell, Denbury, Ipplepen, Kingskerswell, Staverton, Torbryan, Widdecombe in the Moor, <i>Woodland</i> , Wolborough, Coombinteignhead, <i>Haccombe</i> , East Ogwell, <i>West Ogwell</i> , St. Nicholas, Stokeinteignhead, Ashburton, Bick- ington, Bovey Tracey, Highweek, Hennock, Ideford, Ilsington, Kings- teignnton, Manaton, Teigngrace, Bishopsteignton, Chudleigh, Daw- lish, Trusham, East Teignmouth, West Teignmouth, Holne.
XXI.	WONFORD	Ashton, <i>Ashcombe</i> , <i>Dunchideock</i> , Doddiscombeleigh, Exmuister, Ide, Kenn, Kenton, <i>Mamhead</i> , Powder- ham, <i>Shillingford St. George</i> , <i>Netherexe</i> , <i>Upexe</i> , Alphington, Bramford Speke, Christow, Heavitree, Holcombe Burnell, <i>Huxham</i> , Pinhoe, Poltimore, <i>Rewe</i> , St. Leonard, Stoke Canon, St. Thomas the Apostle, Topsham, Upton Pyne, Whitstone, Broadclyst, <i>Clisthydon</i> , <i>Clist St. Lawrence</i> .
XXII.	WOODBURY	Bicton, <i>Clist St. George</i> , Clist Honiton, <i>Clist St. Mary</i> , <i>Clist Satchfield</i> , Colaton Raleigh, East Budleigh, Farringdon, Littleham and Ex- mouth, Lympstone, Otterton, Withycombe Raleigh, Woodbury, Sowton.
	CITIES AND BOROUGHS.	CITIES AND BOROUGHS.
XXIII.	EXETER.	XXX. BARNSTAPLE.
XXIV.	BIDEFORD.	XXXI. OKEHAMPTON.
XXV.	DARTMOUTH.	XXXII. BRADNINCH.
XXVI.	TOTNES.	XXXIII. SOUTHMOLTON.
XXVII.	TIVERTON.	XXXIV. GREAT TORRINGTON.
XXVIII.	DEVONPORT.	XXXV. HONITON.
XXIX.	PLYMOUTH.	

TABLE II.

Shewing the Names of the Signs and the Magisterial Divisions or Municipalities in which they occur.

Nos.	Signs.	Totals.
1	Abbey Inn	2
2	Achilles Arms	1
3	Ackland Arms	1
4	Acland Arms	1
5	Acorn	1
6	Adelaide Inn	1
7	Admiral Hawke	1
8	Admiral Mc. Bride	1
9	Admiral Rodney	1
10	Admiral Vernon	1
11	Agricultural Inn	1
12	Albany Inn	1
13	Albert	1
14	Albert Bridge Inn	1
15	Albert Hotel	1
16	Albert Inn	1
17	Albert Oak	1
18	Albion	1
19	Albion Hotel	1
20	Albion Inn	1
21	Albion Spirit Vaults	1
22	Albion Tavern	1
23	Alfred	1
24	Alma Inn	1

TABLE II.—*continued.*

Nos.	Signs.	Totals.
25	Alphington Inn	1
26	Anchor	1
27	Anchor and Hope	3
28	Anchor Hotel	1
29	Anchor Inn	1
30	Angel	2
31	Angel Hotel	1
32	Angel Inn	1
33	Antelopes	1
34	Antelope Inn	1
35	Apollo	1
36	Appledore Inn	1
37	Army and Navy	1
38	Arscott Arms	1
39	Artichoke Inn	1
40	Artillery Arms	1
41	Artillery Arms Inn	1
42	Arundel Arms	1
43	Arundel Inn	1
44	Ashburton Arms	1
45	Ashford Inn	1
46	Ashley Arms	1
47	Ashprington Inn	1
48	Assembly Rooms	2
49	Athenaeum Hotel	1
50	Avenue Inn	1

TABLE II.—*continued.*

TABLE II.—*continued.*

TABLE II.—*continued.*

Nos.	Signs.	Totals.
101	Blue Ball	2
102	Blue Bell	2
103	Blue Boy	1
104	Blue Posts	1
105	Boar's Head	1
106	Boldventure Inn	1
107	Bolton Arms	1
108	Bolton Hotel	1
109	Boot	2
110	Boot Inn	1
111	Borngdon Arms	1
112	Boscowen	1
113	Bosphorus Inn	1
114	Bowde Inn	1
115	Braddon Arms	1
116	Bradley Hotel	1
117	Bradworthy Hotel	1
118	Braunton Abbotts	1
119	Braunton Inn	1
120	Breakwater Inn	1
121	Brewers Arms	1
122	Brewery	1
123	Brewery Tap	1
124	Bricklayers Arms	2
125	Bridge Inn	1
126	Brighton Inn	1

TABLE II.—*continued.*

Nos.	Signs.	Totals.
127	Bristol	1
128	Bristol Inn	1
129	Britannia	1
130	Britannia Hotel	1
131	Britannic Inn	1
132	British Mechanic	1
133	Brixham Arns	1
134	Brixham Road Hotel	1
135	Broadbury Hotel	1
136	Brook Green Tavern	1
137	Brown Bear	1
138	Brownlow Brewery	1
139	Brownston Inn	1
140	Brunel Arms	1
141	Brunswick Arms	1
142	Brunswick Hotel	1
143	Brunswick Inn	1
144	Buckingham Arms	1
145	Buckingham Inn	1
146	Bude Haven Hotel	1
147	Builders Arms	1
148	Bullers Arms	1
149	Bull's Head	1
150	Bull Inn	1
151	Bunch of Grapes	1
152	Burston Arms	1

TABLE II.—*continued.*

No.	Signs.	Total.
153	Burton Ale House	1
154	Burton Arms	1
155	Butchers Arms	1
156	Cadogan Inn	1
157	Cambridge	1
158	Cambridge Arms	2
159	Cambridge Inn	1
160	Camel's Head Inn	1
161	Canal Inn	1
162	Cannon Inn	1
163	Canteen	1
164	Canteen Inn	1
165	Caprera Hotel	1
166	Carew Arms	1
167	Carlton	1
168	Carlton Inn	1
169	Carpenters Arms	3
170	Cary Arms	1
171	Cary Hotel	1
172	Castle	1
173	Castle and Keys	2
174	Castle Hotel	1
175	Castle Inn	2
176	Cat and Fiddle	1
177	Cattle Market Inn	1

TABLE II.—*continued.*

Nos.	Signs.	Totals.
178	Caxton Arms	1
179	Cellars	1
180	Central Inn	1
181	Champnernowne Arms	1
182	Champion of Wales	1
183	Chapple Inn	1
184	Chedworth Tavern	1
185	Cherry Tree	1
186	Chester Cup	1
187	Chichester Arms	1
188	Chopping Knife	1
189	Chubbs Hotel	1
190	Church House Inn	2
191	Churchill	1
192	City Arms	1
193	Clarence	1
194	Clarence Arms	1
195	Clarence Hotel	1
196	Clarence W. & S. Vaults	1
197	Clay Cutters Arms	1
198	Cleave Hotel	1
199	Clifford's Arms	2
200	Clifton Hotel	1
201	Clifton House Inn	1
202	Clinton Arms	1
203	Clock	1

TABLE II.—*continued.*

Nos.	Signs.	Totals.
204	Clownace	1
205	Coach and Horses	6
206	Coach-builders Arms	1
207	Coach-makers Arms	1
208	Coach Office Inn	1
209	Coal Exchange	1
210	Cobourg Inn	1
211	Colebrook Inn	1
212	College Green	1
213	Colliers Arms	1
214	Colt Inn	1
215	Commerce House	1
216	Commercial	1
217	Commercial Hotel	2
218	Commercial Inn	1
219	Compass	1
220	Compass Inn	1
221	Compan Inn	1
222	Conqueror	1
223	Conqueror's Arms	1
224	Coopers Arms	1
225	Copplestone Cross	1
226	Copplestone Inn	1
227	Corner House	1
228	Corn Exchange Hotel	1
229	Cornfactors Inn	1

TABLE II.—*continued.*

Nos.	Sig.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	X.	XI.	XII.	XIII.	XIV.	XV.	XVI.	XVII.	XVIII.	XIX.	XX.	XXI.	XXII.	XXIII.	XXIV.	XXV.	XXVI.	XXVII.	XXVIII.	XXIX.	XXX.	XXXI.	XXXII.	XXXIII.	XXXIV.	XXXV.	Totals.
230	Cornish Arms	2	5						
231	Cornish Inn	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	2
232	Cornwood Inn	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	2
233	Coronation Inn	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1
234	Cottage Inn	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	2
235	Countess Weir Inn	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1
236	Country House	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	3
237	Country House Inn	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	1
238	Country Inn	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1
239	Courtney Arms	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	6
240	Courtney Railway Hotel	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1
241	Cousin's Commercial Hotel	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	2
242	Cowley Bridge Inn	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1
243	Crabtree Inn	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1
244	Crediton Inn	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	2
245	Cricket Inn	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1
246	Crotchet	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1
247	Cromwell Inn	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1
248	Cross Inn	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1
249	Cross Keys	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	3
250	Cross Cars	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1
251	Crown	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	5
252	Crown and Anchor	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	2
253	Crown and Column	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	3
254	Crown and Sceptre	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	6
255																																				

TABLE II.—*continued.*

No.	Signs.	Totals.
256	Crown and Thistle	1
257	Crown Hotel	1
258	Crown Inn	6
259	Cruwys Arms	1
260	Crystal Palace	1
261	Culloden Inn	1
262	Cumper's Hotel	1
263	Curriers Arms	1
264	Custom House Inn	1
265	Custom House Tavern	1
266	Dart Hotel	2
267	Dartmoor Inn	1
268	Dartmoor Wine Vaults	1
269	Dartmouth Arms	7
270	Dartmouth Inn	1
271	Dawlish Inn	1
272	Devon Arms	3
273	Devon Inn	1
274	Devonport	1
275	Devonport Inn	3
276	Devonshire Arms	1
277	Devonshire Inn	5
278	Devon Volunteer	1
279	Dewdrop	1
280	Dew-drop Inn	1

TABLE II.—*continued.*

Nos.	Signs,	Totals.
281	Dock	1
282	Dock Gate	1
283	Dock Inn	1
284	Doel's Number One	1
285	Dolphin	2
286	Dolphin Inn	1
287	Double Lock	2
288	Douglas Arms	1
289	Dove	1
290	Drake's Arms	1
291	Druggists Arms	1
292	Druids Arms	1
293	Duchy Hotel	1
294	Duchy of Cornwall	1
295	Duke of Cambridge	1
296	Duke of Clarence	1
297	Duke of Cornwall	1
298	Duke of Cornwall Hotel	1
299	Duke of Cornwall Inn	1
300	Duke of Edinburgh	1
301	Duke of Monmouth	1
302	Duke of Somerset	1
303	Duke of Wellington	1
304	Duke of York	1
305	Duke of York & Exeter Inn	1
306	Duke's Head	1

TABLE II.—*continued.*

Nos.	Signs.	
307	Eagle Inn	1
308	Eagle Tavern	2
309	Earl Grey	1
310	East & West Country House	1
311	East Gate Inn	1
312	Eberly Arms	2
313	Ebrington Arms	1
314	Edgcumbe Arms	1
315	Edgcumbe Inn	1
316	Edinburgh Arms	1
317	Elephant and Castle	1
318	Elephant Inn	1
319	Elmfield Hotel	1
320	Elmore Bell	1
321	Emigrant's Arms	1
322	Engine House Inn	1
323	Erme Inn	1
324	Exchange W. & S. Vaults	1
325	Exe Bridge	1
326	Exeter	1
327	Exeter Arms	1
328	Exeter Inn	2
329	Exmouth	1
330	Exmouth Arms	1
331	Fair Mile Inn	1

TABLE II.—*continued.*

No.	Signs.	Totals.
332	Falcon	2
333	Falcon Inn	1
334	Falmouth	1
335	Falmouth Inn	1
336	Falmouth Packet	1
337	Falstaff	1
338	Falstaff Inn	1
339	Family Hotel	1
340	Farley's Hotel	1
341	Fareham Inn	1
342	Farmers Arms	1
343	Farmers Exchange	1
344	Farmers Home	2
345	Farmers Hotel	1
346	Farmers Inn	1
347	Fawn Inn	2
348	Feathers	1
349	Feniton Inn	1
350	Ferry Boat Inn	3
351	Ferry Bridge Inn	1
352	Ferry House	1
353	Field Battery	1
354	Fig Tree	1
355	Fireman's Arms	1
356	First and Last	2
357	First in and Last out	1

TABLE II.—*continued.*

Nos.	Signs,	Total.
358	Fisherman's Arms.	4
359	Five Bells	1
360	Five Oaks	1
361	Floating Bridge Tavern	1
362	Flora Inn	1
363	Flying Horse	1
364	Flying Scud	1
365	Force's Tavern	1
366	Ford Inn	1
367	Foresters Arms	1
368	Foresters Home	1
369	Foresters Pride	1
370	Forest Inn	1
371	Fortescue Arms	1
372	Fortescue Hotel	1
373	Fortescue Inn	1
374	Fortescue Tap	1
375	Fortune of War	1
376	Fountain	1
377	Fountain Head	1
378	Fountain Inn	1
379	Four Horse Shoes	1
380	Four in Hand	2
381	Fox and Grapes	1
382	Fox and Goose	1
383	Fox and Hounds	1

TABLE II.—*continued.*

Nos.	Sig <i>n</i> s.	Tot <i>l</i> s.
384	Fox and Hounds Hotel	1
385	Foxford's Hotel	1
386	Foxhound Inn	2
387	Foxhunters Inn	1
388	Fraser's Arms	1
389	Frederick Inn	1
390	Freemasons Arms	1
391	Friendship	2
392	Friendship Inn	1
393	Fry's Hotel	1
394	Fuller's Arms	1
395	Full Moon	1
396	Galatea Inn	1
397	Gardeners Arms	1
398	Gas-house	1
399	George	2
400	George and Dragon	2
401	George Cole	1
402	George Hotel	1
403	George Inn	1
404	George Street Hotel	2
405	George the Fourth	3
406	Gerrard Arms	1
407	Gerston Hotel	1
408	Gidley Arms	1

TABLE II.—*continued.*

Nos.	Signs.	Totals.
409	Gipsy Tent	1
410	Glanville Inn	1
411	Globe	20
412	Globe and Laurel	1
413	Globe Hotel	8
414	Globe Inn	17
415	Gloucester Arms	1
416	Goblet	1
417	Golden Anchor	1
418	Golden Ball	1
419	Golden Cross	1
420	Golden Eagle	1
421	Golden Fleece	1
422	Golden Inn	1
423	Golden Lion	2
424	Golden Lion Hotel	1
425	Golden Lion Tap	1
426	Good Intent	1
427	Gotswyck Arms	1
428	Granby Cellars	1
429	Granby Inn	1
430	Grand Duchess	1
431	Grapes	1
432	Grapes Tavern	1
433	Grape Vine	1
434	Great House	2

TABLE II.—*continued.*

Nos.	Signs,	Totals.
I.	Great Western Hotel.	1
II.	Green Dragon	6
III.	Gregory's Arms	1
IV.	Greyhound	3
V.	Greyhound Inn	1
VI.	Gribble Inn	1
VII.	Grocers Arms	1
VIII.	Grove Inn	1
VII.	Guardship	1
X.	Guildhall W. & S. Vaults	1
XI.	Gunsmiths Arms	1
XII.	Gun Wharf Inn	1
XIII.	Haddington Hotel	1
XIV.	Half Moon	1
XV.	Half Moon Hotel	1
XVI.	Half Moon Inn	1
XVII.	Half Way House	2
XVIII.	Hampton Court Inn	1
XIX.	Hampton Inn	1
XX.	Ham Street Wine Vaults	1
XI.	Hand and Spear	1
XII.	Hanson Cab Inn	1
XIII.	Harbour	1
XIV.	Harbour Avenue Inn	1
XV.	Hare and Hound	1

TABLE II.—*continued.*

TABLE II.—*continued.*

Nos.	Signs,	Totals.
486	Hoops Inn	1
487	Horse and Groom	1
488	Horse and Groom Inn	1
489	Horse and Jockey	1
490	Hotel	1
491	Houndscombe Inn	1
492	Hour Glass	1
493	Hunters Arms	1
494	Hunters Inn	1
495	Hunters Lodge	2
496	Huntsman	1
497	Iffracombe Hotel	1
498	Iffracombe Inn	1
499	Ilminster Inn	1
500	Imperial Hotel	1
501	Imperial Tavern	1
502	Impregnable	1
503	India Arms	1
504	Inland Sea Inn	1
505	Island Inn	1
506	Jamaica House	1
507	James Street Spirit Vaults	1
508	John Bull	1
509	Joiners Arms	1

TABLE II.—*continued*.

No.	Signs.	I	II	III	IV	V	VI	VII	VIII	VIIIA	VIIIB	VIIIC	VIIID	VIIIE	VIIIX	VIIIXI	VIIIXII	VIIIXIII	VIIIXIV	VIIIXV	VIIIXVI	VIIIXVII	VIIIXVIII	VIIIXVIX	VIIIXVIIA	VIIIXVIIB	VIIIXVIIC	VIIIXVIIID	VIIIXVIIIE	VIIIXVIIIX	VIIIXVIIIXI	VIIIXVIIIXII	VIIIXVIIIXIII	VIIIXVIIIXIV	VIIIXVIIIXV	VIIIXVIIIXVI	VIIIXVIIIXVII	VIIIXVIIIXVIII	VIIIXVIIIXIX	Total.
510	Jolly Bacchus	1											
511	Jolly Sailor	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7
512	Jolly Sailors	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
513	Jolly Waterman	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
514	Jubilee Inn	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
515	Julian Arms	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
516	Kelly Arms	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
517	Ken's Cavern Hotel	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
518	Keyham	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
519	Keyham Tavern	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
520	King's Arms	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	46
521	King's Arms Hotel	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
522	Kingsbridge Inn	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
523	Kingsbridge Road Hotel	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
524	Kingsbridge Road Inn	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
525	King's Head	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
526	King's Head Inn	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
527	Kingsley Hotel	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
528	King of Prussia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
529	King William	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
530	King William the Fourth	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
531	King William the Fourth Inn	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
532	Laira Hotel	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1

TABLE II.—*continued.*

Nos.	Signs,	Totals.
533	Lair Inn	1
534	Lamb	2
535	Lamb and Flag	1
536	Lamb Inn	1
537	Landsdowne Spirit Vaults	1
538	Lee Mill Inn	1
539	Lewis Jones Tavern	1
540	Lew Down Inn	1
541	Life Boat	1
542	Lighter	1
543	Lighthorse Inn	1
544	Lincoln Inn	1
545	Lion	1
546	Lion Inn	1
547	Live and Let Live	1
548	Locomotive Inn	1
549	London Ale House	1
550	London & South-western Hotel	1
551	London Hotel	1
552	London Inn	1
553	London Mail	3
554	London Spirit Vaults	1
555	London Tavern	1
556	Long Bridge	1
557	Long Room Inn	1

TABLE II.—*continued.*

Nos.	Signs.	Totals.
558	Lopez Arms	1
559	Lopez Arms Inn	1
560	Lord Clarendon	1
561	Lord Ebrington Inn	1
562	Lord Exmouth	1
563	Lord High Admiral	1
564	Lord Hood	1
565	Lord Marden	1
566	Lord Melbourne	1
567	Lord Nelson	1
568	Lord Nelson Arms	1
569	Lord Nelson Inn	1
570	Lord Raglan	1
571	Lymington Arms	1
572	Lyndale Hotel	1
573	Lyneham Inn	1
574	Lynton Cottage	1
575	Lynton Inn	1
576	Madeira House	1
577	Mail	1
578	Maltsters Arms	4
579	Maltsters Arms Inn	2
580	Maltscroop	1
581	Maltscroop Inn	1
582	Manchester Unity	1

TABLE II.—*continued.*

Nos.	Signs.	Totals.
583	Manor Hotel	4
584	Manor House	1
585	Manor House Inn	8
586	Manor Inn	2
587	Marine Hotel	2
588	Mariners Hotel	2
589	Mariners Inn	2
590	Marine Tavern	2
591	Maritime Inn	3
592	Market Hotel	1
593	Market House	1
594	Market House Inn	1
595	Market Inn	1
596	Masons Arms	10
597	Mechanics Arms	1
598	Mechanics Inn	3
599	Melbourne Inn	1
600	Mermaid Inn	1
601	Merry Harriers	2
602	Millbay Inn	1
603	Millbay Pier Hotel	1
604	Milehouse Cottage	1
605	Military Arms	3
606	Military Hospital	2
607	Millbridge Inn	1
608	Millers Arms	1

TABLE II.—*continued.*

No.	Signs.	Totals.
609	Miners Arms	1
610	Minerva	2
611	Modbury Inn	1
612	Molesworth Arms	1
613	Moor Park Hotel	2
614	Moreton Inn	1
615	Morice Town Wine Vaults	1
616	Morley Arms	1
617	Morley Inn	1
618	Mount Edgrencombe	1
619	Mount Pleasant	2
620	Mount Pleasant Hotel	1
621	Mount Pleasant Inn	1
622	Mount Radford Inn	1
623	Mutton Arms	1
624	Mutton Cove	1
625	Museum Hotel	1
626	Nag's Head	1
627	Napier Inn	2
628	Napoleon	1
629	Napps Inn	1
630	Naval Hospital Inn	1
631	Naval Reserve	1
632	Navigators Arms	1
633	Navy and Army Inn	3

TABLE II.—*continued.*

Nos.	Signs.	Totals.
634	Navy Arms	1
635	Navy Hotel	1
636	Navy Inn	2
637	Naval Spirit Stores	1
638	Nelson	1
639	Nelson Inn	1
640	Neswick Inn	1
641	New Hampton	1
642	New Bottle	1
643	New Bridge Inn	1
644	New Chapel Inn	1
645	New Coach and Horses	1
646	New Commercial	2
647	New Exmouth	1
648	Newfoundland Inn	1
649	New Fountain	1
650	New Golden Lion	1
651	New Granby	1
652	Newington Inn	1
653	New Inn	1
654	New London	1
655	New London Hotel	1
656	New London Inn	1
657	New Market	5
658	New Market Inn	1
659	New Pier Inn	1

TABLE II.—*continued.*

Nos.	Signs.	Totals.
660	Newport Inn	1
661	New Quay Inn	1
662	New Ring of Bells	4
663	New Road Inn	2
664	New Ship	1
665	New Star	1
666	New Town Inn	1
667	New Wine Shades	1
668	Noah's Ark	1
669	No Place Inn	1
670	Norley Inn	1
2 H	North Country Inn	2
672	North Country Pink	1
673	North Devon Inn	1
674	North Molton Inn	1
675	North Star	1
676	Nottingham Inn	1
677	Nuggett	1
678	Oat Sheaf	2
679	Ocean Inn	1
680	Ocean Mail	1
681	Odd Fellows Arms	6
682	Okehampton Inn	2
683	Olive Branch	1
684		1

TABLE II.—*continued.*

Nos.	Signs.	Totals.
I.		
II.		
III.		
IV.		
V.		
VI.		
VII.		
VIII.		
IX.		
X.		
XI.		
XII.		
XIII.		
XIV.		
XV.		
XVI.		
XVII.		
XVIII.		
XIX.		
XL.		
XLII.		
XLIII.		
XLIV.		
XLV.		
XLVI.		
XLVII.		
XLVIII.		
XLIX.		
XLX.		
XLI.		
XLII.		
XLIII.		
XLIV.		
XLV.		
XLVI.		
XLVII.		
XLVIII.		
XLIX.		
XLX.		
XLI.		
XLII.		
XLIII.		
XLIV.		
XLV.		
XLVI.		
XLVII.		
XLVIII.		
XLIX.		
XLX.		
685	Old Acquaintance	
686	Old Bampton	
687	Old Bee Hive	
688	Old Bell	
689	Old Black Horse	
690	Old Bottle	
691	Old Bun House	
692	Old Cattle Market Inn	
693	Old Church Inn	
694	Old Commercial	
695	Old Dog at Home	
696	Oldenberg Inn	
697	Old Fountain	
698	Old Four Castles	
699	Old George Inn	
700	Old Golden Lion	
701	Old Inn	
702	Old London Inn	
703	Old Maltsgoose	
704	Old Market Inn	
705	Old Quay Inn	
706	Old Ring of Bells	
707	Old Road Inn	
708	Old Rock Inn	
709	Old Sandy Gate Inn	
710	Old Swan	

TABLE II.—*continued.*

Nos.	Signs,		Total.
711	Old White Hart	1	
712	Old White Lion	1	
713	Ordnance	1	
714	Ordnance Arms	1	
715	Oriental	1	
716	Oxenham Arms	1	
717	Oxford	1	
718	Oxford Arms Inn	1	
719	Oxford Inn	1	
720	Pack Horse	1	
721	Pack Horse Inn	1	
722	Palk Arms	1	
723	Palmerston Hotel	1	
724	Palmerston Inn	1	
725	Paper-makers Arms	1	
726	Parade Hotel	1	
727	Parade Inn	1	
728	Park Cottage	1	
729	Parker's Arms	1	
730	Park Inn	1	
731	Parby Arms	1	
732	Partridge Arms	1	
733	Passage House	1	
734	Passage House Inn	1	
735	Passage Inn	1	

TABLE II.—*continued.*

TABLE II.—*continued.*

Nos.	Signs.	Signs.	Signs.	Totals.
763	Portsmouth Arms	.	.	1
763	Portsmouth Hotel	.	.	1
764	Post Office	.	.	1
765	Post Office Inn	.	1	4
766	Potters and Shipwrights Arms	.	.	1
767	Pride of Devon	.	.	1
768	Pride of the Forest	.	.	1
769	Prince Albert	.	1	3
770	Prince Albert Inn	.	.	1
771	Prince Alfred	.	.	1
772	Prince Alfred Inn	.	1	2
773	Prince Arthur	.	1	1
774	Prince Arthur Inn	.	.	1
775	Prince Blucher	.	.	1
776	Prince Consort	.	.	1
777	Prince George	.	.	1
778	Prince George Hotel	.	1	2
779	Prince Regent	.	.	1
780	Prince Rock Inn	.	.	1
781	Prince of Wales	.	1	1
782	Prince of Wales Hotel	.	1	1
783	Prince of Wales Inn	.	2	2
784	Princess Alexandra	.	.	1
785	Princess of Denmark	.	.	1
786	Princess Royal	.	1	4

TABLE II.—*continued.*

Nos.	Sig.	Totals.
787	Princess Royal Inn	1
788	Princess Street Inn	1
789	Prospect Inn	1
790	Providence Inn	2
791	Prussian Eagle	1
792	Punch Bowl	1
793	Queen	1
794	Queen and Constitution	1
795	Queen's Arms	1
796	Queen's Dock	1
797	Queen's Head	1
798	Queen's Hotel	2
799	Queen Victoria	1
800	Race Horse	1
801	Radnor Arms	1
802	Raglan Arms	1
803	Railway	1
804	Railway Home	2
805	Railway Hotel	1
806	Railway Inn	2
807	Raleigh Inn	1
808	Red Cow	1
809	Red Deer	1
810	Red Lion	31

TABLE II.—*continued.*

TABLE II.—*continued.*

Nos.	Sig.	Totals.
837	Rolle's Quay Inn	1
838	Ropemakers Arms	2
839	Rose and Crown	1
840	Roughwood Inn	1
841	Round Tree	1
842	Royal Adelaide Inn	1
843	Royal Albert	1
844	Royal Albert Hotel	1
845	Royal Bath Inn	1
846	Royal Beacon Hotel	1
847	Royal Blue	1
848	Royal Clarence	2
849	Royal Clarence Hotel	1
850	Royal Exchange	1
851	Royal Fort	1
852	Royal George	1
853	Royal Hotel	2
854	Royal Hotel Tap	1
855	Royal Mail Inn	1
856	Royal Marine	1
857	Royal Marine Cantien	1
858	Royal Naval Reserve	1
859	Royal Oak	3
860	Royal Oak Inn	2
861	Royal Sovereign	1
862	Royal Standard	1

TABLE II.—*continued.*

No.	Signs.	Total.
863	Royal Star	1
864	Royal Union Inn	1
865	Ruffwell Inn	1
866	Russell Arms	1
867	Saddlers Arms	1
868	Sailors Home	1
869	Sailors Inn	1
870	Saint Budeaux Inn	1
871	Saltash Inn	1
872	Saltram Tavern	1
873	Salmon Pool	1
874	Salutation Inn	1
875	Salutation Inn	1
876	Sands Hotel	1
877	Sandy Park Inn	1
878	Saracen's Head	1
879	Sawyers Arms	1
880	Seale's Arms	1
881	Sebastopol Inn	1
882	Setting Sun	1
883	Seven Stars	1
884	Seven Stars Hotel	1
885	Seven Stars Inn	1
886	Seymour Arms	1
887	Seymour Hotel	1

TABLE II.—*continued.*

Nos.	Sig.	Totals.
868	Shades	2
889	Shakspeare	2
890	Shakespeare Inn	2
891	Shamrock	1
892	Sheepwash Inn	1
893	Sheet Anchor	1
894	Shepherds Lodge	1
895	Ship	1
896	Ship and Castle	1
897	Ship and Pilot Boat	1
898	Ship and Plough	1
899	Ship in Dock	1
900	Ship Inn	1
901	Ship on Launch	1
902	Shipping Office Inn	1
903	Shipwrights Arms	1
904	Sidmouth Arms	1
905	Sidmouth Inn	1
906	Sir Charles Napier	1
907	Sir Colin Campbell	1
908	Sir Francis Drake	1
909	Sirius Frigate	1
910	Six Bells	1
911	Sky-lark	1
912	Sleeve Board Arms	1
913	Sloop Inn	1

TABLE II.—*continued.*

TABLE II.—*continued.*

Nos.	Signs,	Totals.
940	St. Aubyn Arms	3
941	Steam Boat	1
942	Steam Packet	1
943	Steam Packet Hotel	1
944	Steam Packet Inn	4
945	Steam Reserve	1
946	St. George's Tavern	3
947	St. James's Hall	1
948	St. James's Tavern	1
949	Stoke Canon Inn	2
950	Stokers Arms	1
951	Stokers Return	1
952	Stoke Spirit Vaults	1
953	Stone Cross Inn	1
954	Stonehouse Inn	1
955	Stonehouse Tavern	1
956	Stonehouse Wine Vaults	1
957	Stonemasons Arms	1
958	Stopford Arms	1
959	Stowey Arms	1
960	Stucley Arms	1
961	Sturt's Arms	1
962	Sultan Inn	1
963	Sun	1
964	Sunderland Liverpool	1
965	Sun Hotel	1

TABLE II.—*continued.*

Nos.	Signs.	Totals.
966	Sun Inn	7
967	Sutton Harbour Inn	1
968	Sutton Pool Inn	1
969	Swan	14
970	Swan Inn	11
971	Swan of Avon	1
972	Sydenham Inn	1
973	Talaton Inn	1
974	Talbot Arms	1
975	Talbot's Arms	1
976	Tamar	1
977	Tamar Hotel	1
978	Tandem Inn	1
979	Tavern	1
980	Tavistock	2
981	Tavistock Inn	1
982	Taylor's Arms	1
983	Tea Gardens Inn	1
984	Teign	1
985	Teign House Inn	1
986	Teignmouth Inn	2
987	Terminus Inn	1
988	Tetcott Arms	1
989	Thelbridge Inn	1
990	Thistle Park Tavern	1

TABLE II.—*continued.*

Nos.	Signs,	Totals.
991	Three Cranes	1
992	Three Crowns	2
993	Three Elms	1
994	Three Horse Shoes	4
995	Three Kings Inn	1
996	Three Pigeons	1
997	Three Queens	1
998	Three Tuns	8
999	Thomas Hotel	1
1000	Tiverton Hotel	1
1001	Tiverton House	1
1002	Tiverton Inn	2
1003	Topaze Inn	1
1004	Topsham Inn	1
1005	Torbay Hotel	1
1006	Torbay Inn	2
1007	Torbay Sands Private Hotel	1
1008	Torcross Hotel	1
1009	Torridge Inn	1
1010	Torbill Inn	1
1011	Town Arms	6
1012	Town Arms Inn	1
1013	Town House	1
1014	Tradesman's Inn	2
1015	Tradesman's Arms	8
1016	Trafalgar Inn	2

TABLE II.—*continued.*

Nos.	Signs.	Totals.
1017	Travellers Rest	3
1018	Treby Arms	1
1019	Trout	1
1020	Tuckers Arms	1
1021	Tuckers Hotel	1
1022	Turf Inn	1
1023	Turk's Head	6
1024	Two Mile Oak	1
1025	Two Trees	1
1026	Uncle Tom's Cabin	1
1027	Unicorn's Head	1
1028	Unicorn Hotel	1
1029	Unicorn Inn	1
1030	Union	2
1031	Union Hotel	1
1032	Union Inn	2
1033	United Kingdom	1
1034	United Service	1
1035	United Service Inn	1
1036	Unity Inn	1
1037	Valiant Soldier	2
1038	Valletort Inn	1
1039	Valley Hotel	1
1040	Valley of Rocks Hotel	1

TABLE II.—*continued.*

Nos.	Signs,	Totals.
1041	Vault House	•
1042	Victoria	• 1
1043	Victoria and Albert	• 1
1044	Victoria Arms	• 1
1045	Victoria Hotel	• 1
1046	Victoria Inn	• 1
1047	Victory	• 1
1048	Victory Inn	• 1
1049	Victory of Alma	• 1
1050	Victualling Office Tavern	• 1
1051	Vine	• 1
1052	Vine House	• 1
1053	Vine Inn	• 1
1054	Vintners Arms	• 1
1055	Vintry W. & S. Vaults	• 1
1056	Volunteer	• 2
1057	Volunteer Inn	• 1
1058	Vulcan	• 1
1059	Walkhampton Inn	• 1
1060	Walsden Arms	• 1
1061	Warkleigh Hotel	• 1
1062	Warn's Hotel	• 1
1063	Warren House Inn	• 1
1064	Washington Hotel	• 1
1065	Waterloo	• 1

TABLE II.—*continued.*

No.	Signs,	Totals.
1066	Waterloo Inn	1
1067	Waterman's Arms	5
1068	Waterman's Inn	1
1069	Welchman's Arms	1
1070	Welcome Friend	1
1071	Welcome Inn	1
1072	Wellington Inn	1
1073	Wellington Arms	1
1074	Wellington Hotel	1
1075	Wellington Inn	1
1076	West Country Inn	1
1077	Western Dock Hotel	1
1078	Western Hotel	1
1079	West Hoe Inn	1
1080	West India House	1
1081	Westward Ho Hotel	1
1082	Wheat Sheaf	1
1083	Wheat Sheaf Inn	1
1084	Wheelwrights Arms	1
1085	Whitchurch Inn	1
1086	White Ball	1
1087	White Bull	1
1088	White Cross	1
1089	White Cross Inn	1
1090	White Hart	1
1091	White Hart Hotel	1

TABLE II.—*continued.*

Nos.	Sig.	Totals.
1092	White Hart Inn	1
1093	White Horse	2
1094	White Horse Inn	1
1095	White Lion	1
1096	White Lion Inn	1
1097	White Pack Horse	1
1098	White Rose Inn	1
1099	White Swan	1
1100	White Thorn Inn	1
1101	Who'd Have Thought it?	1
1102	William the Fourth	1
1103	Windmill Hill	1
1104	Windsor Arms	1
1105	Windsor Castle	1
1106	Windsor Hotel	1
1107	Withleigh	1
1108	Woodford Hotel	1
1109	Woodland Fort	1
1110	Woodman Inn	1
1111	Woodside Inn	1
1112	Wyndham Arms	2
1113	Wyndham Inn	1
1114	Yacht Club Hotel	1
1115	Yarcombe Inn	1
1116	Yarmouth Inn	1

TABLE II.—*continued.*

No.	Signs.	Totals.
1117	Yealbridge Inn	1
1118	Yealmonth Inn	1
1119	Yellow Rose Inn	1
1120	Yeo Vale Hotel	1
1121	York Hotel	4
1122	York Inn	2
1123	Zetland Arms	1
Totals . .	63 40 124 48 47 95 93 27 27 21 26 20 40 54 1130 92 79 124 73 150 84 44 130 42 26 28 49 201 339 70 12 9 25 16 27	

The following examples will serve to explain Table II:—The numerals in the first or left hand column denote the number or order of the Sign in the Table, which is arranged alphabetically. The second column contains the names of all the Signs in the county. The first Sign in the list is the ABBEY INN. Opposite the name, and under each of the Roman numerals XV. and XXIX., at the head of the Table, the number 1 is inserted, and in the right hand or last column the number 2 occurs. The last numeral (2) shows that in the county there are two houses bearing the sign. On turning to Table I., it will be found

that XV. denotes the Magisterial "Division" of Paignton, and XXIX. the Borough of Plymouth; hence we learn that such a sign occurs in the Paignton "Division" and at Plymouth, that there is but one such sign in each, and no such sign elsewhere in the country.

At the end of the Table the number 63 occurs at the bottom of the column having the Roman numeral I. at its head. This denotes that there are 63 houses licensed to sell alcoholic drinks and having signs in the "Division" indicated by I., which Table I. shows to be that of Axminster, and so on.

Table II. shows that at present there are in Devonshire 2,475 inns, &c., having 1,123 different kinds of Signs,—the differences being very slight in a large number of cases. Some Signs are, of course, much more popular than others, as the following summary of Table II. shows :—

TABLE III.

1 sign occurs 104 times	3 signs occur 13 times
1 " 46 "	1 " 12 "
1 " 36 "	7 " 11 "
1 " 33 "	7 " 10 "
1 " 32 "	7 " 9 "
1 " 31 "	7 " 8 "
1 " 24 "	13 " 7 "
2 " 23 "	18 " 6 "
2 " 20 "	18 " 5 "
1 " 19 "	29 " 4 "
1 " 18 "	49 " 3 "
3 " 17 "	124 " 2 "
2 " 15 "	820 " once
2 " 14 "	

The following Table contains the names of all the Signs that occur at least four times :—

TABLE IV.

Repetitions.	NAMES.
104	New Inn.
46	King's Arms.
36	White Hart.
33	London Inn.
32	Royal Oak.
31	Red Lion.
24	Rising Sun.
23	Golden Lion, Union Inn.
20	Exeter Inn, Globe.
19	Ring of Bells.
18	Commercial Inn.
17	Globe Inn, Half Moon, Ship Inn.
15	Church House Inn, Railway Hotel.
14	Hare and Hounds, Swan.
13	Dolphin, George Inn, Railway Inn.
12	Bell Inn.
11	Barnstaple Inn, Bridge Inn, Prince of Wales, Royal Hotel, Seven Stars, Ship, Swan Inn.

TABLE IV.—*continued.***Repetitions.**

	NAMES.
10	Black Horse, Masons Arms, Old Inn, Plymouth Inn, Queen's Arms, Rose and Crown, Victoria Inn.
9	Albert Inn, Anchor Inn, Carpenters Arms, Castle Inn, Dolphin Inn, Foresters Arms, Lamb.
8	Globe Hotel, Golden Fleece, Manor Inn, Queen's Hotel, Three Tuns, Tradesman's Arms, White Horse.
7	Bell, Buller's Arms, Butchers Arms, Commercial Hotel, Dartmouth Inn, Jolly Sailor, London Hotel, Palk Arms, Queen's Head, Shipwrights Arms, Star, Sun Inn, Volunteer Inn.
6	Anchor, Angel, Blue Anchor, Coach and Horses, Courte- nay Arms, Crown and Sceptre, Crown Inn, Duke of York, Fountain Inn, George, Green Dragon, King's Head, Odd - Fellows Arms, Royal Standard, Sports- man's Arms, Town Arms, Turk's Head, White Lion.
5	Cornish Arms, Country House, Crown, Devonshire Inn, Fountain, George and Dragon, Half Way House, Horse and Groom, Hunters Inn, New Market Inn, Phoenix, Red Cow, Rolle Arms, Royal Exchange, Union Hotel, Victoria, Volunteer, Waterman's Arms.
4	Bakers Arms, Barley Mow, Beehive, Black Dog, Britannia Inn, Castle, Castle Hotel, First and Last, Fisherman's Arms, Fortescue Arms, Fox and Hounds, Freemasons Arms, George Hotel, Horse and Jockey, King of Prussia, Lamb and Flag, Maltsters Arms, Manor Hotel, Market House Inn, New Quay Inn, Pack Horse, Poltimore Arms, Post Office Inn, Princess Royal, Smith's Arms, Star Inn, Steam Packet Inn, Three Horse Shoes, York Hotel.

During a thoughtful perusal of Table II., each Sign is calculated to suggest a distinct enquiry, and not unfrequently several such enquiries. Thus, for example, the ABBEY INN, with which the Table opens, prompts the questions—1st. How many, and what, "ecclesiastical" signs are there ? 2nd. Since the house takes its name from an adjacent abbey, how many, and what, "geographical" and "topographical" signs are there ? 3rd. As the house professes to be an Inn, and not an Hotel or Tavern, how many "Inns," "Hotels," and "Taverns" are there in the county respectively ? and which designation has the preference ? and so on in other cases.

In the following pages it is intended to pursue such ques-

tions as may thus present themselves, and in the order in which they occur.*

Ecclesiastical :—In this category will be placed all Signs derived from religious edifices or objects appertaining to them, as well as from ministers of religion of any form.

The county contains but five different Signs derived from *Religious Edifices* :—The ABBEY INN, CHURCH HOUSE INN, HERMITAGE, NEW CHAPEL INN, and OLD CHURCH INN. The ABBEY INN occurs twice—at Plymouth and at Torquay. At the latter it is a beer-shop, and, in common with *Abbey Road*, in which it is situated, takes its name from the neighbouring Tor Abbey. It is noteworthy, perhaps, that neither Buckfast, Buckland, Hartland, nor Tavistock Abbey appears to have suggested a sign board.

The authors of the *History of Sign Boards*† state that at the present day the CHURCH is a very common ale-house sign, and they seem in doubt whether this is “on account of the esteem in which good living has been held by churchmen in all ages, or from the proximity of a church to the alehouse in question,” or in order that topers may be enabled “to say that they ‘frequently go to church.’” They also mention other signs connected with the church, such as the CHAPEL BELL, the CHURCH STILE, and CHURCH GATES.

Whilst there is in Devonshire no instance of either of the foregoing, the CHURCH HOUSE INN presents itself no fewer than fifteen times, and within my own recollection still more frequently. Indeed, the county holds but fifteen signs in greater estimation.‡ It is restricted, however, to a comparatively small part of the county, which may be thus defined :—One occurs at Stoke-in-teign-head, about a mile south of Teignmouth, and another at Walkhampton, about four miles south-east of Tavistock ; the former is the most north-easterly and the latter the most north-westerly of the series, and a line joining them lies on the north of all the others. Four of them lie within a short distance of the town of Kingsbridge, and until very recently there was a fifth in the same district.

As this sign is not named by the authors just mentioned,

* In the remarks which follow I have been favoured with information from numerous friends, and especially Revs. F. Bullock, Dr. Cornish, G. Grey, and R. Kirwan, and Messrs. W. Bovey, J. Browne, J. R. Chanter, H. S. Gill, G. E. Hearder, W. Vicary, and R. N. Worth.

† Page 321. Sixth Edition.

‡ In making this statement I have regarded the GLOBE and the GLOSS INN as one and the same sign.

it seems highly probable that it does not occur, or is very rare, beyond our own county, and may be the Devonshire substitute for the CHURCH so very common, it is said, elsewhere.

But why did the Devonians, or, rather, those of them dwelling in the south-western angle of the county, prefer the substitute? And why is Kingsbridge the nucleus round which they have a tendency to cluster?

In answer to these questions, I venture on the following hypothesis until a better is found:—South Devon, as is well-known, was a stronghold of Puritanism during the troublous times of the Stuarts. A “General Baptist” congregation existed at Moreton-hampstead as early as the 16th century, and a nonconformist body—Independents and Baptists united—appears to have been established at Plymouth between the years 1620 and 1640. In 1649, Abraham Cheare, pastor of the latter, was, for his nonconformity and for encouraging religious assemblies, sent to Exeter gaol, where he remained three months. The next year he was again committed to the same prison, and not released until 1665. His liberty was but of brief duration, for he was soon after sentenced to perpetual banishment on Drake’s island, in Plymouth Sound, where he died in 1668.* Five clergymen connected with Plymouth were silenced in 1662. One of them, Rev. G. Hughes, vicar of St. Andrews, Plymouth, was also sent to Drake’s island, where he remained nine months, when he was released upon giving £2,000 security not to come within 20 miles of Plymouth. He retired to Kingsbridge, where he died in 1667.† “Plymouth,” says Mr. Worth, “enjoys the distinction of being the only town in the West of England that remained true throughout the whole of the wars between Charles and his Parliament to the cause it at first espoused. The townsfolk were strongly Puritan.”‡

Kingsbridge, the rendezvous of the Parliamentary forces of Devonshire during the siege of Plymouth by the Royalists,§ afforded a refuge to several of the ejected ministers besides the Rev. G. Hughes, just mentioned. Amongst these was the Rev. John Hicks, who, after being ejected from the living of Stoke Damerel on the accession of Charles II., and of Saltash in Cornwall in 1662, became the minister of the town. He appears to have been a man but little likely to brook ill treatment tamely, nevertheless, during many years

* See “History of Plymouth.” By R. N. Worth. 1871. pp. 162-3.

† Ibid. p. 167. ‡ Ibid. p. 63.

§ Ibid. pp. 73-4.

a large measure of it fell to his lot. The date of the Baptist Church at Kingsbridge is given as 1640, and in the chapel there still exists a tablet "to commemorate the names of Leonard Kent, Philip Weymouth, and Arthur Langworthy, who with others in the reign of Charles II. laboured and suffered for the truth's sake, in connexion with this Church."*

Proceeding now to the Earl of Kingsbridge :—The Rev. John Flavel, a Puritan divine of great learning and ability, and the author of several works, was expelled from the living of Dartmouth on account of his refusal to comply with the Act of Uniformity of 1662. He still continued to preach and administer the sacraments privately until 1665, when the passing of the Oxford Five-mile Act compelled him to retire to Slapton, a village between Dartmouth and Kingsbridge ; and for the next twenty years he underwent every kind of hardship and persecution. Dartmouth, like Plymouth, declared for the Parliament, and it held out against Prince Maurice for one month and four days. It was afterwards garrisoned for the king, but three years later was retaken by Fairfax.†

But to return : The Puritans, as is known to all, understood the Church to be "a congregation of faithful men," and in their anxiety not to confound it with the building set apart for worship, they termed the latter the *Church House*. The fifteen sign boards which still remain, I hold to be so many historical fossils of views and feelings which once were prevalent in the district, and may not yet be utterly extinct.

Ministers of Religion do not appear to be held largely in sign-board esteem in Devonshire ; a fact which seems to negative one of the suggested explanations, already mentioned, of the prevalence of the CHURCH as a sign. Be this as it may, the DRUIDS ARMS at Plymouth, BISHOP BLAIZE at Cullompton, BISHOP BLAZE at Exeter, and BRAUNTON ABBOTS at Braunton, near Barnstaple, exhaust the list ; and to tell the whole truth, it seems not improbable that the Plymouth innkeeper pays his compliment not to the pre-Christian British hierarchy, but to a local club or friendly society, or even to the *Druid* ship of water.

The Bishops *Blaize* and *Blaze* are no doubt one and the same person—St. Blasius, Bishop of Sebaste, in Cappadocia, and patron of the wool combers.‡ The town of St. Blazey, in

* "Kingsbridge Estuary." Compiled by S. P. Fox. 1864. Chap. ii.

† "Trans. Devon. Assoc." vol. iii. p. 132.

‡ See "Hist. Brit. Sign Boards," p. 283.

Cornwall, near which he is said to have landed in the third century, is named after him.*

Mr. J. R. Chanter kindly informs me that the inn at Braunton known as the BRAUNTON ABBOTS "is simply so called after the manor of which it is parcel. In the time of the Henries the manor, which then belonged to the Crown, was split up and granted to several different parties—one of them the Abbot of Cleve. Hence the name."

BELLS and their RINGERS are in Devonshire the most popular signs having a connexion with the Church, there being a total of fifty-four. The former appear in various forms, such as the BELL, BLUE BELL, BARRINGTON BELL, ELMORE BELL, OLD BELL, RING OF BELLS—sometimes with the prefix NEW or OLD—FIVE BELLS and SIX BELLS. The BLUE BELL may, of course, be the flower of that name, but as some sign boards bear an illustration of it in the form of a church bell painted blue, this probably is not the case, the colour being adopted as a "difference" merely. Mr. H. S. Gill has been so good as to inform me that the two public houses known as the BARRINGTON BELL and ELMORE BELL are situated in two old districts of Tiverton called respectively *Barrington* and *Elmore*, and that doubtless the Inns were so styled to distinguish one from the other. There seems to be no explanation for the FIVE BELLS of Ottery St. Mary. The only instance of SIX BELLS occurs at Payhembury, the parish church of which has a peal of six bells.

Seven Devonshire inns derive their names from a *Cross*; but so far as I have been able to ascertain, COPPLESTONE CROSS at Crediton is the only one having an "ecclesiastical" relationship. It takes its name from a very ancient monument in the middle of the village of Copplestone, believed to be of Saxon date. It is about twelve feet high and rudely ornamented with scroll work.† With the possible exception of the GOLDEN CROSS at Devonport, the WHITE CROSS at Collaton Raleigh, and the WHITE CROSS INN at Woodbury Salterton, about which I have failed to get any information, the others belong to "topographical" crosses.

Geographical and Topographical :—It has been already stated that the ABBEY INN, at Torquay, takes its name from the neighbouring Tor Abbey. It will be found that no fewer than 360 signs, representing 583 houses, are *geographical* or *topographical*, including prominent buildings and natural objects, such as Castles, Churches, Rocks, Trees, &c.

* Murray's "Hand Book of Devon and Corn." 6th Ed. 1865, p. 247.

† Ibid. p. 163.

The most popular of the series is LONDON, which in various forms occurs 49 times. The GLOBE runs it very closely as there are 46 instances of it, some of them in combination with other objects.

Of Devonshire towns, EXETER, the capital of the county, appropriately takes the lead, and occurs thirteen times. BARNSTAPLE, the chief town of North Devon, follows next, and appears eleven times, or once more than PLYMOUTH. DARTMOUTH is met with seven times, TIVERTON five times, DEVONPORT four, and ILFRACOMBE and EXMOUTH three each. It is not improbable, however, that the EXMOUTH ARMS at Stonehouse may directly refer, not to the town at the mouth of the Exe, but to the celebrated Admiral Lord Exmouth.

Of English towns beyond Devonshire, BEDFORD stands next to London, and is represented by seven signs, YORK by six, BRISTOL and CAMBRIDGE by four each, and FALMOUTH, OXFORD, and WINDSOR by three each. The BEDFORD signs, however, are in all probability in compliment to the Duke of Bedford, not directly to the town whence his title is derived; and the fact that at least most of the signs in question occur in districts possessed by the House of Russell, renders this almost a certainty. The CAMBRIDGE signs also, all occurring at Plymouth or Devonport, have probably direct reference, not to the university town, but to the ship of war of that name, for many years the guardship in Hamoaze.

Scotland has four representatives—the CULLODEN INN, EDINBURGH ARMS, HADDINGTON HOTEL, and HIGHLANDER—for two of which she is no doubt indebted to the Dukes of Cumberland and Edinburgh. Perhaps the CROWN AND THISTLE at Cullompton also belongs here.

With the exception of the UNITED KINGDOM and SHAMROCK at Devonport, and the WELCHMAN'S ARMS at Plymouth, there is in Devonshire no sign-board hint of the existence of either Ireland or Wales.

Twenty-one signs and twenty-three houses remind passers by that there are districts beyond the British Archipelago. Amongst these, BRUNSWICK—ARMS, HOTEL, and INN—not unreasonably takes the lead. It is followed by ALMA, NEWFOUNDLAND, TRAFALGAR, and WATERLOO, each having two houses. The remaining signs have each one house only.

The following Devonshire rivers have their representative signs—LAIRA and TAMAR, two each, AVON, DART, ERME, TEIGN, and TORRIDGE. The ALMA is the only foreign river recognized; a distinction due, of course, to the gallant manner in which the allies crossed it. Artificial inland navigation is

not quite forgotten, there being a CANAL INN at Tiverton, a COUNTESS WEIR INN at Topsham, and a DOUBLE LOCK in the parish of Alphington; the first having reference to the *Grand Western Canal*, and the last to the *Exeter Ship Canal*.

Omitting CAMBRIDGE, KINGSBIDGE, &c., there are seventeen signs commemorative of BRIDGES, one of which, the ALBERT BRIDGE spanning the Tamar, is a proud and, in all probability, an enduring monument of engineering skill.

Five Devonshire FERRIES and ten PASSAGES have attained to sign-board fame.

The OCEAN and some of its more important branches are recognized in nine signs; and, as may be anticipated in a great maritime county, BREAKWATERS, DOCKS, HARBOURS—the last under various names—LIGHTHOUSES, PIERS, COVES, and QUAYS are duly honoured. Nineteen houses, having eighteen distinct signs, represent this class of objects.

In passing to towns and objects in other English counties, the Devonians do not seem free from partialities, as the following table shows:—

Middlesex is represented by	.	.	.	55	houses
Cornwall	“	by	.	15	”
Bedford, Gloucester, and York shires, each, by	.	.	.	7	”
Cambridge, Somerset, Stafford, and Lancashires, each, by	.	.	.	4	”
Berk, Hamp, Oxford, and Che shires, each, by	.	.	.	3	”
Buckinghamshire, Durham, and Sussex, each, by	.	.	.	2	”
Derby, Dorset, Leicester, Lincoln, and Notting- ham shires, and Norfolk and Surrey, each, by	.	.	.	1	”

Omitting the metropolitan county, to which the great popularity of London necessarily secures the chief place, Cornwall takes the lead. It is, perhaps, worthy of remark that whilst Devonshire is bounded by Cornwall, Dorsetshire, and Somersetshire, and, in consequence of the Tamar, is less closely united with the first than with either of the others, its sign-board connexion with its western neighbour is three times as great as that with the two eastern counties taken together. Though in a few respects the peoples of the two south-western counties differ from one another, as, for example, in their modes of wrestling, they so closely resemble each other in most particulars, amongst which may be mentioned the similarity of their verbal provincialisms, their proverbs, and the preparation of clotted cream and junkets, as to suggest an ethnic relationship closer than that subsisting between the inhabitants of Devonshire and those of either of its two other border counties; and no one acquainted with the history

of the south-western horn of Britain can be unprepared for this. *Cornwall—the horn of foreign land*—did not always denote the region west of the Tamar merely. Its primal meaning was *the land beyond the Saxon, or English, rule*; in other words, *the land still held by the independent British*. The eastern boundary of this gradually retreated westward to the Tamar, where it found a resting place, and *Cornwall* became a geographical rather than an ethnological term. Plymouth has long borne the name of the “Cornishman’s London,” and to me the joke has always appeared so expressive of a truth, as to lead me to regard Plymouth as the capital of *Cornishmen*, and were it not that geographical propriety forbids I would say of *Cornwall* also. It may be too much to ask from our Exonian brethren, otherwise the great town between the Plym and Tamar might be appropriately regarded as the metropolis of the two south-western counties.

Public buildings of different kinds have in certain instances suggested the names of signs, as the following table shows:

Buildings.		Sigs.	Buildings.		Sigs.	
Castle	.	.	20	Athenæum	.	1
Market	.	.	12	Bank	.	1
House	.	.	11	Barbican	.	1
Office	.	.	8	Guildhall	.	1
Battery	.	.	3	Lighthouse	.	1
Fort	.	.	3	Museum	.	1
Exchange	.	.	2	Room	.	1
Gate	.	.	2	Station	.	1
Hospital	.	.	2			

Some of the CASTLES, so far as the districts themselves are concerned, appear to be merely imaginary. Probably the CASTLE in each of the parishes George-Nympton, Northmolton, and Landkey is a reflection of that on Castle Hill, the seat of Earl Fortescue, near which they are all situated. The CASTLE INN at Torquay took its name from an adjacent castellated house erected about forty years ago. The CASTLE HOTEL at Lynton probably borrows its name from the well-known so-called *Castle Rock*, near at hand. Barnstaple, Dartmouth, Exeter, Lidford, and Plympton devote a house, each, to perpetuate the Castle they still, or formerly did, possess, but of which, with the exception of the second, ruins

alone remain. Barnstaple, indeed, has little or nothing left but the mound on which its Castle stood.* It is probably not easy to say whether the CASTLE INN at Dawlish has reference to Powderham Castle, the residence of the Earl of Devon, in its neighbourhood, or to the Old Camp, known as *Castle Ditch*, on Little Haldon, from two to three miles from the town. Exeter, not content with rearing its CASTLE HOTEL in memory of its *Rougemont Castle*, the name of which so startled Richard III.,† has also a WINDSOR CASTLE.

The MARKETS present but little variation, being sometimes MARKETS simply, sometimes INNS or HOTELS—the former predominating—sometimes OLD or NEW, and sometimes CATTLE MARKETS.

The HOUSES are of different kinds, the MARKET HOUSE being the most popular. Besides this, the CUSTOM HOUSE occurs twice, the ENGINE HOUSE, GASHOUSE, and LIGHTHOUSE, each once. They are all at Plymouth, with the exception of one CUSTOM HOUSE at Exeter.

Amongst OFFICES, the POST OFFICE is most popular. The others are the VICTUALLING OFFICE at Stonehouse, and COACH OFFICE and SHIPPING OFFICE, both at Plymouth.

The three BATTERIES, as might have been expected, are divided between the "three towns" of Plymouth, Devonport, and Stonehouse, which also monopolize the two HOSPITALS—MILITARY at Devonport, and NAVAL at Stonehouse.

The three FORTS are the ROYAL FORT, at Devonport; the WOODLAND FORT, in the parish of St. Budeaux, near Plymouth; and HEMBURY FORT, in the parish of Payhembury; the last being the only sign-board recognition of the numerous ancient hill-fortresses of Devonshire.

The EXCHANGE occurs twice, and is a COAL EXCHANGE at Plymouth and a CORN EXCHANGE at Exeter—a distinction tolerably characteristic of the two towns.

The DOCK GATE at Devonport refers, of course, to the Royal Dock Yard, to which it is adjacent; whilst the EAST GATE at Totnes is in honour of the well known East Gate in the principal street of that ancient town.

Learning is not quite ignored, since Plymouth has its ATHENÆUM HOTEL, and Exeter its MUSEUM HOTEL.

The BANK OF ENGLAND has secured a sign-board at Devonport, but no other banking house has been thought worthy of so great an honour, there or elsewhere in the county.

* See "Sketches of some Striking Incidents in the History of Barnstaple." By J. R. Chanter. 1865. pp. 12-14.

† "King Richard III." Act iv. sc. ii.

Plymouth alone boasts a BARBICAN INN, and this refers, indirectly perhaps, to the Barbican of the "strong Castel quadrate" mentioned by Leland.* The site of the Barbican, however, is now occupied by a pier bearing the same name.

I learn from Mr. Worth that the following is the history of the sign of the LONG ROOM INN at Stonehouse :—A spot near Millbay was the great resort of the beaux and belles of Plymouth a century ago. It was at first a garden and promenade; afterwards a "Long Room" was built as a dancing room. This room still exists, but has been converted into offices occupied by the military authorities. An inn now stands near it, and has taken it as its sign.

Tavistock alone has a STATION HOTEL.

The Devonshire innkeeper is by no means unmindful of Manorial claims. There are in the county eight MANOR INNS, four MANOR HOTELS, one MANOR HOUSE, and one MANOR HOUSE INN.

Prominent or famous natural objects are in some instances celebrated on sign boards, and amongst them *Rocks* take the lead. The CLEAVE HOTEL, in the parish of Lustleigh, has reference, of course, to the adjacent Lustleigh Cleave, so much and so deservedly visited by geologists and tourists. The OLD ROCK INN at Brixham seems to be without known explanation. PRINCE ROCK INN at Plymouth, Mr. Worth writes me, derives its name from a spot close by the Plymouth, or western, end of the Laira Bridge. It is mentioned in the old Map of Plymouth during the siege in 1643,† but, though it is one of the Borough bounds, not in the charter of 1440. The name was probably given at the time of the siege under Prince Maurice.

The Rock in the parish of Ilsington refers to *Haytor Rock* in the same parish—the object whence one of the "Hundreds" of Devonshire derives its name. The ROCK HOTEL in the parish of Buckland Monachorum is in allusion, no doubt, to the Rock on Roborough Down. The ROCK HOUSE in the parish of Georgeham is so called from being built on a small rocky hill behind the church. The ROCK INN in the parish of Tavistock takes its name, in all probability, from the well known Morwell Rocks, overhanging the Tamar, near which it stands; and the VALLEY OF ROCKS HOTEL at Lynton celebrates one of the most romantic spots in that delightful neighbourhood.

* "The Itinerary of John Leland the Antiquary." Third Edition. Oxford. MDCLXIX. vol. iii. fol. 22, p. 44.

† See Worth's "History of Plymouth," p. 64.

Lynton also boasts a VALLEY HOTEL, but impartially abstains from stating whether its preference is for the East or the West Lyn. The Valley of the Yeo has also inspired an inn-keeper; for in the parish of Lapford there is a YEO VALE INN.

Eminences have a greater popularity. The great central upland of the county is duly signboarded at Plymouth, and in the parishes of Chagford, Lidford, and Whitchurch,—the first having its DARTMOOR WINE VAULTS, the second its MOOR PARK HOTEL, and the third and fourth each their DARTMOOR INN. Of *Mounds* there are six—a MOUNT EDGCUMBE at Devonport, a MOUNT RADFORD INN at Exeter, and four instances of MOUNT PLEASANT. The last, however, does not necessarily imply an eminence, it being “a name frequently bestowed upon public houses simply on account of its being an alluring name of the maudlin class.”* Kentisbearne derives its PONCHIDOWN INN from the neighbouring portion of *Black Down*; and Exmouth, its ROYAL BEACON HOTEL, from the modest eminence on which the house stands. Exeter has a WINDMILL HILL, but to what it refers seems unknown. There is no hill of that name in or near the city, nor is there any tradition of the existence of a Windmill within its bounds.

Two *Hoteis* take their names from the *Sands* on which they stand,—TORBAY SANDS HOTEL in the parish of Paignton, and SANDS HOTEL in that of Slapton. Exmouth, to suit those who object to houses on *Beacons*, has a BEACH HOTEL.

Though Devonshire is rich in celebrated *Caverns*, they have to be content with only one sign board: Torquay has a KENT'S CAVERN HOTEL.

As has been already stated, three of the CROSS inns are certainly of topographical derivation. These are the CROSS INN in the parish of Sherwill, near Barnstaple, SPITZLER'S CROSS in the parish of South Tawton, and STONE CROSS INN in the parish of Swymbridge, all of which take their names from adjacent Cross Roads.

Before dismissing *Geographical* and *Topographical* sign boards, a few words must be given to NO PLACE INN and PENNY COME QUICK INN—both in suburban Plymouth. They have, no doubt, a facetious aspect, and certainly have been facetiously employed, but are strictly topographical in their origin. The first is in a district termed *No Place*, near Eldad Church; and has a large sign board over the door on which a man is represented, quite “half seas over,” and near his cottage door. Here he encounters his wife; a virago, unless the

* “Hist. of Sign Boards,” p. 434.

artist has done her injustice, who demands, "Where have you been?" and receives the innocent reply, "No Place." This sign is mentioned by Larwood and Hotten.* The second is by no means intended to convey the idea that "mine host" turns, or hopes to turn, a "ready penny," but innocently takes its name from *Penny-come-quick*—the locality in which it stands. The name is the same as that which the town of Falmouth anciently bore, and, according to Mr. Bellows, is nothing more than a Saxon pun on the Cornish words *Pen y cwm gwic*, = "Head of the creek valley;"—an apt description of the spot.†

Inns, Hotels, and Taverns :—Many of the houses call themselves INNS, others HOTELS, others TAVERNS, a few WINE AND SPIRIT VAULTS, whilst more than 50 per cent. are silent on the point. The *Inns* are the most popular, and amount to 359, *Hotels* to 119, and *Taverns* to 21; the numbers being nearly as 18 : 6 : 1.

Mythological :—Thirty-eight houses display mythological signs—the term being understood to be not restricted to the fables of ancient Greece and Rome. The GOLDEN FLEECE occurs eight times, and is the most popular; the PHœNIX seven times, the GREEN DRAGON six, GEORGE AND DRAGON five; the UNICORN three times, VULCAN twice, ACHILLES, APOLLO, FLORA, GALATEA, JOLLY BACCHUS, MINERVA, and MERMAID, each, once. Almost the whole of them are at Plymouth or Devonport, and were probably taken, not from Lempriere, but from the list of ships of war in commission—a source of many strange signs in the same towns.

The first five appear to have been always popular in this country. The authors of the *History of Signboards*, seem to think that whilst the GOLDEN FLEECE is suitable for the sign of a woollen draper, "at the door of an inn or public-house it looks very like a warning of the fate the traveller may expect within—in being fleeced.‡ The PHœNIX is not monopolized by innkeepers, but has always been used as a sign by chemists, as his fabulous history is supposed to typify certain chemical transformations.§ In the early part of the 17th century there were as many as seven instances of the GREEN DRAGON amongst the London Taverns.|| That GEORGE AND DRAGON

* Op. Cit. p. 458.

† See "Chips from a German Workshop." By F. Max Muller, M.A. Vol. iii. p. 304. 1870.

‡ p. 72.

§ Ibid. p. 198.

|| Ibid. p. 111.

should be popular in England is what might have been anticipated as a matter of course. The authors so frequently quoted in this paper state that "in London alone there are at present not less than sixty-six public-houses and taverns with this name, not counting the beer-houses, coffee-houses, &c."* The qualities ascribed to the UNICORN has caused this animal to be used as a sign by goldsmiths, chemists, apothecaries, and printers, as well as inn-keepers.†

Neither *Achilles*, *Flora*, nor *Galatea* appear to be mentioned in the *History of Signboards*, but appropriate honours are paid there to all the other Olympians celebrated in Devonshire. That BACCHUS should be a favourite is quite natural; and that he should be JOLLY might be expected with equal certainty. The authors so frequently referred to here make the following remarks respecting him:—"In Holland and Germany we have seen a Beer King, (a modern invention certainly,) named Cambrinus, taking the place of Bacchus at the beer-house door; but according to the sixteenth century notions, Bacchus included beer in his dominions."‡ They state elsewhere that "mythology does not mention a Beer-God."§ Obviously they have overlooked the following passages in Diodorus Siculus, who, speaking of Bacchus, says, "There's neither *Greek* nor *Barbarian*, but have tasted of his grace and bounty; yea even those that inhabit the most barbarous countries altogether unfit for the planting of vines, learnt from him to make drink of barley, little inferior for deliciousness of taste to wine."|| Again. "He found out likewise the manner of making drink of barley; some call it Zythus; for taste and smell not much inferior to wine, which art he especially taught them whose country was not fit for planting, or producing of vines."¶

The MERMAID has her Devonshire home inappropriately located in the inland town of Barnstaple. The sign belongs to the history of English literature, and recalls the great names of Raleigh, Shakespeare, Ben Jonson, Beaumont, Fletcher, Selden, Carew, Martin, Donne, and Cotton—all members of the club which met at the *Mermaid* in Bread Street; whilst another, in Cheapside, though less famous, was celebrated as having been frequented by Jasper Mayne and John Dryden.**

Heraldic—The Devonshire innkeepers appear to be fond

* "Hist. of Sign Boards," p. 287. + Ibid. p. 159. ‡ p. 69. § p. 155.

|| Booth's Translation. MDCC. Bk. iii. ch. iv. ¶ Bk. iv. ch. i.

** "Hist. of Sign Boards," pp. 226-7.

of *heraldic* signs, but it may be doubted whether some of the ARMS they have set up are known at the Herald's office. There are in the county as many as 253 sign-boards, i.e. 22 per cent. of the entire number, bearing *Arms* of some kind. There is, however, a sufficient recurrence of the same names to reduce the number to 165 distinct signs, or names of "coats."

The list contains the ARMS of a hero who died, and a hierarchy that had passed away,—ACHILLES and the DRUIDS—before the founding of the Heraldic system; of Royal, noble, and other distinguished personages; of proprietors of the soil; of countries, counties, cities, towns, and villages; of trades and employments; and of objects difficult of classification.

Though our excellent queen's reign has already lasted thirty-five years, the KING'S ARMS is the most popular of the series and occurs 46 times, whilst the QUEEN'S ARMS occurs only ten times. It has been already stated that the former is next to the NEW INN the most popular sign in the county.

Of the ARMS of landed proprietors, those of BULLER and PALK are the most frequent, each occurring seven times. The former is met with in six "Divisions" of the county, the latter in five. If, however, the DEVON ARMS be that of the Earl of Devon and be added to the COURtenay ARMS, they make a total of nine, and surpass each of the two families just mentioned.

The CORNISH ARMS presents itself five times, but that of DEVONSHIRE once only. If, however, the DEVON ARMS be that of the county, and if this as well as the SOUTH DEVON ARMS be included, the total equals that for the sister county. As may be expected, the CORNISH ARMS occurs near the junction of the two counties.

Of trades and employments, the MASONS seem most popular with the inn-keepers, as their ARMS occurs ten times, or as frequently as the QUEEN'S ARMS. It is possible, however, that at least in some cases the *Arms* may be that of a family named *Mason*. The same remark may apply in several other cases. An inn at Plymouth has the odd combination of the POTTERS' AND SHIPWRIGHTS' ARMS. So far as can be gathered from the sign-boards of Devonshire, several trades are destitute of *Arms*, such as Shoemakers, Spinners, Tailors, Weavers, &c. The Tailors, however, are not utterly forgotten, as there is at Sidmouth an inn bearing the SLEEVE-BOARD ARMS; and though the Heralds may have some hesitation respecting the "Coat," the connexion of *Sleeve Boards* with *Arms* cannot be doubted.

The trades just mentioned cannot be expected to bear their neglect with equanimity, since several others have been brought prominently forward without, it may be presumed, any greater claims. If we are to believe the innkeepers of Hennock, Stonehouse, and Devonport, the CLAY-CUTTERS, EMIGRANTS, FIREMEN, and STOKERS have ARMS.

The FORESTERS eclipse all other *Societies*, as their ARMS occurs nine times, whilst those of the ODD-FELLOWS and FREEMASONS are met with six times and four times respectively.

To this category the following belong, of course:—the FEATHERS, PLUME OF FEATHERS, PRUSSIAN EAGLE, and SPREAD EAGLE—the first and third occurring each once only, and the second and fourth three times each.

Botanical :—Eighty-two houses, having forty-two distinct signs, are more or less connected with the vegetable kingdom. This number embraces FLORA, FOREST, GROVE, ROUND TREE, and Two TREES.

The OAK in its various forms and connexions, including the ACORN, which opens the list, occupies a place on thirty-nine sign-boards, or very nearly one half of the whole. This large number is almost entirely due to the prevalence of the ROYAL OAK, of which, as has been already stated, there are thirty-two instances. Omitting this, the GRAPE VINE appropriately takes the lead, with nine sign-boards; and BARLEY suitably follows with seven. WHEAT is recognized by five houses, the BLUE BELL, ROSE, and THISTLE each by two, and the remaining botanical objects by one each.

Royalist :—Upwards of 360 Devonshire houses are devoted to Royalty; and of these a considerable number, of course, are in honour of the reigning sovereign and her family. Twenty-one bear the name of VICTORIA, sometimes with, but more frequently without, the QUEEN prefixed. She is accredited with an INN ten times, ARMS once, and an HOTEL once; and at Torquay is supported by ALBERT.

The QUEEN, without any means of identification, occurs twenty-eight times, including ten ARMS. Once she precedes the CONSTITUTION. An HOTEL is ascribed to her eight times, a HEAD seven times, and a DOCK once.

The Heir apparent is presented to us as DUKE OF CORNWALL four times, and fourteen times as PRINCE OF WALES. His DUCHY OF CORNWALL is mentioned twice, his FEATHERS once, and his PLUME OF FEATHERS thrice. Two signs are appro-

priated to his Princess—as the PRINCESS OF DENMARK and the PRINCESS ALEXANDRA.

The PRINCESS ROYAL has five houses to do her honour, all bearing the same sign, without further variation than that one calls itself an INN, whilst the others are silent on the question.

If we may suppose him to be the ALFRED referred to at Devonport, and the ROYAL TAR at Dartmouth, the Duke of Edinburgh has six houses. PRINCE ARTHUR appears twice, PRINCE GEORGE three times, and the DUKE OF CAMBRIDGE once.

No other living members of the British Royal Family are recognized; but there are several signs in honour of some of those deceased. Thus, the late PRINCE CONSORT, as such, appears once; and with his christian name in various combinations as many as twenty-two times. The most noteworthy of these are the ALBERT BRIDGE INN in the parish of St. Budeaux, and the ALBERT OAK at Plymouth. The former has reference of course to the imposing structure by which Brunel carried the Railway into Cornwall, across the Tamar. The latter, so far as can be gathered, seems to have been the invention of an artist of exuberant loyalty, who knew that Oaks were connected with Royalty somehow, but not being clear as to the exact way, saw no reason why the late Prince Consort should not have his OAK.

Our Queen's immediate predecessor is still represented by twelve houses, whose signs are more frequently CLARENCE or DUKE OF CLARENCE than KING WILLIAM or WILLIAM THE FOURTH. It may be presumed that as he was the last to bear the title, he was the LORD HIGH ADMIRAL referred to at Stonehouse. His Queen has two signs—ADELAIDE INN and ROYAL ADELAIDE INN.

No fewer than twenty-eight houses bear the name of GEORGE, not unfrequently without accompaniment of any kind; but when it is remembered that our annals contain four consecutive kings, and that we have one patron saint, of that name, it is obvious that the only one of them that can with safety be assigned to the "first gentleman of Europe" is the GEORGE THE FOURTH, in the parish of Marlborough. Three houses continue to remind us of the REGENT.

The JUBILEE INN, occurring twice at Plymouth and once at Wembury, are the only certain sign-board remembrances of George III.

KINGS, but without individualization, are very popular. The KING'S ARMS occurs forty-six times, as has been already stated, and his HEAD seven times.

The DUKE OF YORK is by no means rare. If the FREDERICK INN of Plymouth be supposed to refer to him, his memory is perpetuated by eight houses in the county,—two of them being at Exeter.

Before passing from British Royal personages, it is perhaps worth stating that Topsham retains a sign in honour of the unfortunate DUKE OF MONMOUTH, who was executed 87 years ago.

Their loyalty to their own Royal family, does not deprive the Devonian innkeepers of a willingness to remind their customers of the existence of foreign princes. Thus, we meet the KING OF PRUSSIA four times, a GRAND DUCHESS, a NAPOLEON, an OLDENBERG INN, and a SULTAN INN, each once.

The KING OF PRUSSIA has long retained his place over British inn doors. The monarch referred to was our ally, *Frederick the Great*, who, after the battle of *Rosbach* in 1759, became the popular hero of England, and according to Macaulay, "the sign printers were everywhere touching up ADMIRAL VERNON into the KING OF PRUSSIA."* The GRAND DUCHESS, at Plymouth, was probably *Marie of Russia*, who on several occasions has resided in Devonshire for months together. Whether the NAPOLEON, also at Plymouth, was the first or third of the dynasty there seems no positive evidence to show. The probabilities, however, are greatly in favour of the latter; for, to say nothing of the fickleness of sign-board fame, it cannot be doubted that the difference in the feelings with which their British contemporaries regarded the two Buonapartes is very decidedly in favour of him. The OLDENBERG INN, adjacent to Paignton Sands, took its name from the late *Prince Peter of Oldenberg*, who drove thither almost daily for the purpose of bathing, during his residence at Torquay, a few years since. The SULTAN INN, at Plymouth, dates, no doubt, from the visit of *Abdil Aziz* to England, in 1867.

Royal personages, however, by no means exhaust the list of signs appropriated to their order. The CROWN—sometimes INN, once HOTEL, but frequently neither—occurs twelve times, besides eleven times with various accompaniments; the SCEPTRE being the most frequent as well as most appropriate. Plymouth, but no other place, thoughtfully remembering that a *Crown* suggests a great ceremonial, has consistently opened a CORONATION INN.

Nor is the principal residence of our own sovereigns for-

* See "Hist. of Sign Boards," p. 54.

gotten, as the WINDSOR ARMS at Plymouth, WINDSOR CASTLE at Exeter, and WINDSOR HOTEL at Barnstaple testify.

The epithet ROYAL occurs 65 times, being prefixed to OAK 33 times, HOTEL thirteen times, STANDARD six times, and EXCHANGE five times. IMPERIAL, less English, is also less popular than ROYAL, and occurs but three times; twice to qualify an HOTEL and once a TAVERN. It does not condescend to an INN.

Admirals :—Twenty-one houses are devoted to Admirals, as shown in the following Table, in which the arrangement is chronological, the dates given being those of the deaths of the heroes.

Signs.	Places.	Dates.	Popularity.
DRAKE'S ARMS	Yarcombe	1595	176 years.
SIR FRANCIS DRAKE	Plymouth		,
RALEIGH INN	Ditto	1618	153 ,
ADMIRAL VERNON	Alphington	1757	114 ,
DITTO	Barnstaple		,
BOSCAWEN	Devonport	1761	110 ,
ADMIRAL HAWKE	Cullompton	1781	91 ,
ADMIRAL RODNEY	Ilfracombe	1792	79 ,
ADMIRAL MAC BRIDE	Plymouth	1800	71 ,
LORD NELSON	Stonehouse		,
LORD NELSON ARMS	Exeter		,
DITTO	Plymouth		,
LORD NELSON INN	Kingskerswell		,
DITTO	Totnes	1805	66 ,
DITTO	Plymouth		,
NELSON	Dartmouth		,
NELSON INN	Topsham		,
LORD HOOD	Devonport	1816	55 ,
LORD EXMOUTH	Plymouth	1833	38 ,
NAPIER INN	Devonport		,
SIR CHARLES NAPIER	Plymouth		,

It is not unreasonable that Nelson should be the popular hero, but it cannot be denied that Devonshire is somewhat chary in according sign-board honours to her great naval sons. Drake has but two signs, even if that at Yarcombe is intended for him. Raleigh's name is kept alive by one house at Plymouth only. Davis, Hawkins, Gilbert, and Grenville are utterly ignored.

In addition to the ADMIRAL VERNON at Alphington and

Barnstaple, there is at Bideford a PORTO BELLO—the scene of his triumph. In like manner Plymouth and Dartmouth have each a TRAFALGAR INN in honour of Nelson.

Agricultural :—The Agricultural interest is represented by thirty-six houses, of which two are indefinite AGRICULTURAL INNS. Seven are devoted to *Farmers* in the forms of one FARMERS ARMS, one FARMERS EXCHANGE, the FARMERS HOME twice, FARMERS HOTEL twice, and FARMERS INN once. The PLOUGH occurs six times, and the remaining twenty-one are divided between *Grain* and *Grazing*, the former taking eighteen. Amongst these there is a HARVEST HOME twice, a CORN EXCHANGE HOTEL once, and a CORN FACTORS INN once, leaving fourteen to represent *Barley*, *Wheat*, and *Oats*. The first takes the lead, as might have been expected from its connexion with *Beer*, and appears four times as a BARLEY Mow, twice as a BARLEY SHEAF, and once as BARLEYCORN. The WHEAT SHEAF occurs five times, and the OAT SHEAF twice.

The *Graziers* are recognized by three houses, having the name of CATTLE MARKET, one with the prefix OLD.

The PLOUGH, according to Larcombe and Hotten, “leads the van among agricultural signs.”* In Devonshire, however, it is surpassed by the FARMER. The same use is occasionally made of it as, according to the authors just named, is made of the CHURCH. I remember a young Cornish farmer, too often found at the village inn, of whom his acquaintances remarked with ironical approval, that “no man so steadily followed the PLOUGH.”

“THE OATSHEAF,” the writers just quoted remark, “is very rare.”† Devonshire, as we have seen, has two specimens of this rarity—one at Crediton and one at Exeter.

Battles, &c. :—The soul of the Devonshire innkeeper delighteth not in our great victories in war. He has done no more than charge nine of his houses to keep alive the memory of six of them—PORTO BELLO, 1739; CULLODEN, 1746; TRAFALGAR, 1805; WATERLOO, 1815; ALMA, 1854; and the fall of SEBASTOPOL, 1855. The oldest has outlived the event it commemorates by 132 years. It may perhaps be regretted that the Ashburton innkeeper has not yet concluded that he has sufficiently reminded his customers of the triumph of the house of Hanover over that of Stuart, and that the time has come when, without disadvantage to any one, he might per-

* “Hist. of Sign Boards,” p. 361.

† Ibid. p. 252.

petuate a battle less stained by the atrocities which followed it than that of CULLODEN. This battle, however, seems to have at one time enjoyed great sign-board popularity. Macaulay states that it was the "total annihilation" of Vernon, the Porto Bello hero, and that "the Duke of Cumberland kept possession of the sign board a long time."* It is, perhaps, noteworthy that though Devonshire is a maritime county, and contains one of our great naval stations, only two of the victories celebrated—*Porto Bello* and *Trafalgar*—were achieved by the Royal navy.

Nautical :—That we should devote 178 houses to the service of bearing nautical signs is no more than might have been expected. Twenty-one of these, as has been already stated, are in recognition of eminent admirals. There are in all fifty-two craft of various kinds, including thirty-four repetitions of the SHIP—one being NEW, one IN DOCK, one ON LAUNCH, one followed by a PILOT BOAT, and one by a PLOUGH. There is one SIRIUS FRIGATE, one SLOOP, and one LIGHTER. A LIFE-BOAT occurs twice, a GUARD SHIP once, a STEAM PACKET six times, a STEAM BOAT once, a FERRY BOAT three times, a FLOATING BRIDGE once, and NOAH'S ARK—the oldest recorded ship—once.

The authors of the *History of Signboards* say there "is scarcely a town in the Kingdom that has not a SHIP inn, tavern, or public-house;"† there are, however, ten Devonshire "Divisions" and six municipal towns—Totnes, Okehampton, Bradninch, Southmolton, Great Torrington, and Honiton—destitute of this prevalent institution. The same authors speak of the SHIP ON LAUNCH as occurring in every ship-building locality.‡ The only instance of it in Devonshire is in that part of the town of Bideford termed "East-the-Water." They also state that "NOAH'S ARK is not an uncommon public-house sign,"§ but the only case of it in this county is in "Old Town Street," Plymouth.

Next to the craft themselves, come those who man them, including ADMIRALS, SAILORS, WATERMEN, MARINERS, NAVIGATORS, NAVAL RESERVES, STEAM RESERVES, STOKERS, PILOTS, a YACHT CLUB, and a ROYAL TAR. SAILORS preponderate, and like the WATERMEN, but no other of their colleagues, are, on sign-board authority, frequently JOLLY.

Due provision is made for the guidance, safety, accommodation, and reparation of the ships and their crews, since

* See "Hist. of Sign Boards," p. 54.

+ Ibid. p. 328. ‡ Ibid. p. 330. § Ibid. p. 259.

there are two examples of a COMPASS, thirty of an ANCHOR, three of a HARBOUR, one of a POOL, one of a BREAKWATER, one of a LIGHTHOUSE, three of a PIER, three of a QUAY, three of a DOCK, two of a DOCK GATE, seven of SHIPWRIGHTS ARMS, one of a NAVAL HOSPITAL, one of a SHIPPING OFFICE, and one of an OCEAN MAIL. There are no *Stores* of any kind, and but little attention seems to be given to speed, as there are neither *Spars*, nor *Sails*, nor *Rudder*, and but one pair of CROSS OARS.

In three instances the Devonshire ANCHOR is followed by HOPE, and in four preceded by a CROWN ; the first being an allusion, no doubt, to Heb. vi. 19, where Hope is described as "an anchor of the soul." The only instance of a SHEET ANCHOR in this county occurs at Plymouth : Larcombe and Hotten appear to make no mention of CROSS OARS, of which we have an instance at Beer Ferris on the Tamar.

Upwards of a dozen houses belong to the *Nautical* category, simply in consequence of using such epithets as MARINE, MARITIME, NAVY, and NAVAL.

Small and Artificial :—There are 163 houses in our county, using sixty distinct signs, taking their names wholly or partially from small, artificial, and, in most cases, portable objects, including implements. The BELL, the most popular amongst them, occurs forty-nine times ; the CROWN follows next, and presents itself thirty-four times ; and the ANCHOR lags but little behind, as there are thirty-one instances of it. Below these prime favourites, the THREE TUNS presents itself eight times, the PLOUGH six times, the BALL, BEEHIVE, HORSE-SHOES, and SCEPTRE, each five times, the BOOT, FLAG, and MALTSCOOP, each four times, the CHESTER CUP, COMPASS, and BOTTLE, each twice, FIDDLE, CHOPPING KNIFE, CLOCK, KEYS, OARS, GOBLET, HARP, HOOPS, HOUR GLASS, COACH, PUNCH BOWL, and SLEEVE BOARD, each once only.

Many of them have numerical and other qualifications, and most of them have some sort of accompaniment. All the BALLS are BLUE or GOLDEN, and in all probability are in their origin identical with the pawnbroker's symbol. One of the MALTSCOOPS is NEW, and one of the BOTTLES is NEW and the other OLD. The FIDDLE is associated with a CAT, the KEYS, as well as the OARS, are CROSS. The HARP is joined with a LION, the COACH is appropriately connected with HORSES, and the SLEEVE BOARD bears ARMS.

Compound :—Forty-two distinct signs—some of them but

slight variations—employed by ninety-six houses, are of a compound character, and consist of two or more things united. The following is the entire list :

Signs.	Instances.
ANCHOR AND HOPE .	3
ARMY AND NAVY .	1
CASTLE AND KEYS .	1
CAT AND FIDDLE .	1
COACH AND HORSES .	6
CROWN AND ANCHOR .	2
CROWN AND ANCHOR INN .	2
CROWN AND COLUMN .	1
CROWN AND SCEPTRE .	5
CROWN AND THISTLE .	1
DUKE OF YORK AND EXETER INN .	1
EAST AND WEST COUNTRY HOUSE .	1
ELEPHANT AND CASTLE .	3
FIRST AND LAST .	4
FIRST IN AND LAST OUT .	1
FOX AND GRAPES .	1
FOX AND HOUNDS .	4
FOX AND HOUND HOTEL .	1
GEORGE AND DRAGON .	5
GLOBE AND LAUREL .	1
HAND AND SPEAR .	1
HARE AND HOUND .	1
HARE AND HOUNDS .	14
HARE AND HOUNDS INN .	1
HARP AND LION .	1
HEN AND CHICKEN .	1
HORSE AND GROOM .	4
HORSE AND GROOM INN .	1
HORSE AND JOCKEY .	4
LAMB AND FLAG .	4
LIVE AND LET LIVE .	2
NEW COACH AND HORSES .	1
POTTERS AND SHIPWRIGHTS ARMS .	1
QUEEN AND CONSTITUTION .	1
REST AND BE THANKFUL .	1
ROSE AND CROWN .	10
SHIP AND CASTLE .	1
SHIP AND PILOT BOAT .	1
SHIP AND PLOUGH .	1
STAR AND GARTER .	1
SUNDERLAND AND LIVERPOOL .	1
VICTORIA AND ALBERT .	1

Many of the combinations, like the HEN AND CHICKEN, are

perfectly natural, and others, like the STAR AND GARTER, though having no necessary connexion, are easily understood; but no inconsiderable number, of which the CAT AND FIDDLE may be taken as an example, appear quite inexplicable.

The authors of the *History of Signboards* speak of HOPE AND ANCHOR being a constant sign with shop and tavern keepers.* In this county, however, there is no instance of the things combined in this order, nor do the authors just mentioned give any example of the Devonshire arrangement of ANCHOR AND HOPE.

The CASTLE AND KEYS does not appear an unreasonable combination; the presence of the latter objects being probably intended to represent the surrender of the stronghold. Our only instance of the sign occurs at Devonport. Nothing of the kind is mentioned by Larcombe and Hotten.

The origin of the CAT AND FIDDLE is by no means obvious. It appears, nevertheless, to be not an uncommon sign. The authors so frequently quoted make the following remarks respecting it:—"The CAT AND FIDDLE is still a great favourite in Hampshire. The only connexion between the animal and the instrument is that the strings are made from the cat's entrails, and that a small fiddle is termed a *kit*, and a small cat a *kitten*. Besides, they have been united from time immemorial in the nursery rhyme—

‘Heigh diddle, diddle,
The cat and the fiddle.’

Amongst other explanations offered is, the one that it may have originated with the sign of a certain *Caton fidele*, a staunch Protestant in the reign of Queen Mary, and only have been changed into the cat and fiddle by corruption; but, if so, it must have lost its original appellation very soon, for as early as 1589 we find ‘Henry Carr, signe of the Catte and Fiddle in the Old Chaunge.’ Formerly there was a Cat and Fiddle at Norwich, the cat being represented playing upon a fiddle, and a number of mice dancing round her.”† The only instance of this sign in Devonshire is met with in the parish of Sowton in the Woodbury “Division.” May it not have had its origin in some fable, now forgotten? The FOX AND GRAPES show that signs have had such a parentage.

The CROWN AND ANCHOR is very prevalent, being the symbol of the Royal Navy.

The CROWN AND COLUMN, Ker Street, Devonport, is duly mentioned in the *History of Signboards*, where it is thought

* Page 73.

† Page 438.

"perhaps to imply the strength of royalty when supported by a powerful and united nation."* The following, however, is the true history of the sign :—The town now known as Devonport, was formerly termed *Plymouth Dock*, which, in the neighbourhood at least, was abridged into *Dock*. On January 1st, 1824, it exchanged this name for *Devonport* by Royal sanction ; and to commemorate the event, a lofty column was reared in Ker Street. The inn in question was erected just before the column was built, and "mine host" took for his sign the CROWN AND COLUMN ; the latter being the adjacent monument, to which, in order apparently to have two strings to his bow, he prefixed the *Crown*, being probably guided thereto by alliteration.

Larcombe and Hotten speak of the THISTLE AND CROWN as a "not uncommon national badge, adopted mostly by publicans of North British origin."† The same objects are combined on a sign at Cullompton, but the Crown precedes the Thistle ; Englishmen probably thinking more of the former than of the latter, to say nothing of their probable preference for alphabetical order.

The EAST AND WEST COUNTRY HOUSE at Plymouth probably sprang from the brain of a thorough business man, desirous of entertaining travellers from all directions. To a kindred genius perhaps we may ascribe the POTTERS AND SHIPWRIGHTS ARMS in the same town, and also the SUNDERLAND AND LIVERPOOL at Devonport. It may be presumed that a Pottery and a Shipbuilding yard existed near the former, and that the latter was in the neighbourhood of a wharf whence *Packets* and *Traders* sailed to the two ports it patronized.

The ELEPHANT AND CASTLE appears to be a somewhat venerable sign. The best known, as well as earliest example of it is no doubt that at Newington Butts, which is said to have originated thus :—Some time about 1714, a Mr. Conyers, a great collector of antiquities, was digging in a gravel pit in a field near the Fleet, not far from Battle Bridge, when he discovered the skeleton of an elephant. The elephant gave its name to the public-house soon after erected in that locality.‡

In the south-west of England the mention of the FIRST AND LAST INN takes us in imagination to the Land's End, simply because it is well known that such a sign exists there. It is obvious that though quite appropriate near the most westerly point of our island, as indicating the first public-

* See "Hist. of Sign Boards," p. 103.

† Ibid. p. 126. ‡ Ibid. p. 156.

house to those who enter and the last to those who leave the country, it would be equally so at the Lizard Point or near Yarmouth—the most southerly and easterly points respectively. No doubt the feeling of having reached the terminus was most decided when standing on the Land's End, especially before the discovery of America, because there was no land opposite to it. It is said that it was under the influence of this feeling that Wesley, when standing on the Land's End, composed the well-known hymn beginning—

“Lo, on a narrow neck of land,
‘Twixt two unbounded seas I stand.”

Be this as it may, the sign as given above occurs four times in Devonshire, besides one modification of it. In each case it was, no doubt, intended to mark the first and last public-house of the town or village.

The modification just spoken of presents itself at Bideford, and is in the form of the FIRST IN AND LAST OUT—the suggestion perhaps of a schoolmaster impressed with the necessity for full and minute explanation.

The sign, however, does not appear to be always geographical, for, according to Larcombe and Hotten, “the CRADLE AND THE COFFIN, or FIRST AND LAST, was formerly a sign in Norwich, and one can still be seen near the South Quay, Yarmouth,”* where, as has been already stated, it would be geographically appropriate.

No such sign as the GLOBE AND LAUREL, or HAND AND SPEAR is mentioned in the *History of Sign Boards*. The former occurs at Stonehouse, and the latter in the parish of Musbury, near Axminster. No other combination in which the *Hand* appears exists in Devonshire, though Larwood and Hotten mention compounds elsewhere in which it forms a part.

The HARE AND HOUNDS is said to be very common, and is borne out by the fact that it occurs fifteen times in this county alone. In a sign in the parish of Bigbury the Hare seems to have a better chance for her life, as she is followed by a single HOUND.

So far as I have been able to discover, the HARP AND LION at Plymouth is without a parallel anywhere. Its meaning, if it have any, seems very far to seek.

The LAMB AND FLAG is a common sign, and represented originally the holy lamb with the nimbus and banner. Larwood and Hotten state that “on an alehouse at Swindon the

* See “Hist. of Sign Boards,” p. 464.

Lamb is pictured with a spear, to which a red-white-and-blue streamer is appended.*

It may be hoped that the landlords of **LIVE AND LET LIVE**, in the parishes of Staverton near Totnes, and Stockland near Axminster, so treat their customers as to justify their sign. Possibly, however, their appeal is to their more successful rivals in trade.

REST AND BE THANKFUL seems well suited for a house in a fatiguing district and far removed from others. The sign is not unusual; but the only instance of it in Devonshire occurs in the parish of Cheriton Bishop.

The **ROSE AND CROWN**, according to Larwood and Hotten, "may be observed on not less than forty-eight public-houses in London alone, exclusive of beer-houses."† It is said to owe its origin to the Tudors. There are ten instances of it in Devonshire.

The **SHIP AND CASTLE** is a compound sign of common occurrence, it is said; but it has never been explained. The only instance of it in this county occurs at Combhamartin. Possibly its origin, and that also of the **SHIP AND PLOUGH**, at Dodbrooke, should be sought in the Herald's office.

Supernatural :—In their signs, the Devonshire innkeepers deal but little with the supernatural. The **ANGEL** occurs ten times, and exhausts the category. The original Angel is believed to be Gabriel, who appeared to the Virgin at the Annunciation.

Zoological :—Three hundred and twenty-nine houses, having ninety-six distinct signs, represent various branches of the Animal Kingdom; the entire series being thus divisible:—*Mammals* two hundred and seventy-six, *Birds* forty-five, *Fishes* three, and *Insects* five.

Of the mammalia, the **LION** occurs seventy-seven times, **DEER** fifty-one times, **HORSE** forty, **DOG** thirty-five, **DOLPHIN** twenty-one, **LAMB** sixteen, **Ox** eleven, **BEAR** five, **ANTELOPE** three, **Fox** twice, and the **BEAVER**, **BOAR**, **CAMEL**, and **CAT**, each once.

The **LION** presents himself in such a variety of aspects as to make sixteen distinct signs, but he only once consents to be plural. He is **RED**, or **GOLDEN**, or **WHITE**, or **BLACK**, or silent respecting colour; **OLD**, or **NEW**, or much more frequently neither. Twice he appears without qualification or accompaniment of any kind. Once, as already stated, he is

* See "Hist. of Sign Boards," p. 300.

+ Ibid. p. 121.

preceded by an Harp. His favourite character is the RED LION, which he assumes thirty-seven times, whilst he only presents himself in WHITE attire on twenty-seven occasions.

The Cervine animals which find favour with the inn-keepers are the WHITE HART, STAG, and RED DEER—the first being so far the most popular as to absorb forty-five of their fifty-one signs. This popularity of the *White Hart* dates from the most remote antiquity.*

The HORSE, when his colour is specified, is most frequently BLACK, then WHITE, and lastly BAY. Once he is merely a COLT, and twice he is represented by a NAG'S HEAD. He appears as a RACE HORSE once, and once also as a FLYING HORSE—probably a famous Race-horse, such as *Flying Chil-ders* or *Eclipse*, though according to some *Pegasus* is meant. Six times he is attended by a GROOM, and once by a JOCKEY. There is one example of COACH AND HORSES, and six of the PACK HORSE of olden times and modes of conveyance.

Man's faithful companion appears under the names of HOUND, DOG, HARRIER, and BEAGLE. The HOUND is sometimes stated to be GREY, and one FOXHOUND presents itself. He frequently follows the HARE, and occasionally the Fox. The HARRIERS are sometimes MERRY. All the DOGS are said to be BLACK, except one, who, his labours apparently over, appears in the character of the OLD DOG AT HOME. The signs derived from the *Canidae* are almost all of them suggestive of sport.

I have not hesitated to place the DOLPHIN amongst the mammals, though Larwood and Hotten have classed him with the fishes. Of this very old sign, there are twenty-one instances in Devonshire, but they present no variety in their names.

The *Ovine* genus is in this county exclusively represented by the LAMB, of which there are sixteen instances, all without qualifying phrase or epithet of any kind, but four of them are attended by a *Flag*, as already stated.

The BULL, six times, and the Cow, five times, give their names to signs. One of the former is BLACK, one WHITE, and one exhibits his HEAD only. The Cow is invariably RED.

The BEAR is seen five times. The BROWN BEAR, at Devonport, is the only instance of qualification. Bruin has not with us the popularity he is said to enjoy elsewhere, nor is there in Devonshire any example of the pun on his name which in other parts of England seems to have been common,

* See "Hist. of Sign Boards," pp. 112-6.

in consequence of the words *Bear* and *Beer* being pronounced alike; in some districts the former taking the correct sound of the latter, and in others the reverse.*

The ANTELOPE occurs at Exeter and Plymouth. The sign is said to be not very common.

We have seven instances of the FOX; but Reynard is never alone, being attended by a GOOSE, GRAPES, or HOUNDS; the last being most frequent.

The BEAVER, a sign not mentioned by Larwood and Hotten, occurs in the parish of Northam, but not elsewhere in the county. The BOAR and the CAMEL are each represented by a HEAD only. The CAT appears but once; and then, as we have seen, she brings a FIDDLE.

The Ornithological favourite is the SWAN, there being a total of thirty-one instances of it, leaving only fourteen for all the other birds. One of the SWANS is BLACK, but it does not seem so much esteemed as the WHITE, of which there are three. The EAGLE occurs four times, and once is GOLDEN. There are three instances of the DOVE, and one each of the GOOSE, HEN AND CHICKEN, PEACOCK, SKY-LARK, THREE CRANES, and THREE PIGEONS.

The GOOSE, as seems not unusual on sign-boards, is preceded by a FOX. The SKY LARK does not appear to be mentioned in the *History of Sign Boards*. Both the THREE CRANES and THREE PIGEONS seem to have been favourite signs. Each of them has been immortalized by Ben Jonson.†

It is, perhaps, making the most of the materials to state that there are three ichthyological signs in the county. The first is the PILCHARD INN at Bigbury, where a large amount of capital was formerly embarked in the Pilchard fishery; the second is the SALMON POOL, which doubtless owes its attraction to its inhabitants; and the third is the TROUT, at Axminster.

Reptiles are entirely ignored, and the only sign connected with the invertebrata is the BEE HIVE, of which there are five, one of them being OLD.

Military :—Ninety-six innkeepers apparently feel it their duty to uphold the military spirit of the county. Our forces are placed under the protection of MINERVA,—who appears at Plymouth only,—and GEORGE AND DRAGON—seen in five different parts of the county. Of strongholds, we have as many as eighteen CASTLES, three FORTS, two BATTERIES, one

* See “Hist. of Sign Boards,” p. 152.

† Ibid. pp. 204–5, and 218–9.

BLOCK HOUSE, and one BARBICAN. The ELEPHANT AND CASTLE appears three times, MILITARY ARMS three times, a STANDARD twice, a SPREAD EAGLE and a PRUSSIAN EAGLE each once, a HAND AND SPEAR once, and a VALIANT SOLDIER twice. There is a CANTEEN in four different places, a MILITARY HOSPITAL at Devonport, whilst Plymouth and St. Mary Church, near Torquay, hold out the temptation of the FORTUNE OF WAR. There are as many as six instances of the fraternization of the *Army and Navy*. Thrice as the NAVY AND ARMY, twice as the UNITED SERVICE, and once as the ARMY AND NAVY.

Of what in a popular sense may be termed the *Army*, the *Artillery* and *Volunteers* are alone specially mentioned. Twice we have ARTILLERY ARMS, twice ORDNANCE, and once CANNON. No fewer than seventeen houses are devoted to the VOLUNTEERS, but no special mention occurs of the *Infantry*, *Cavalry* or *Militia*.

The names of the following British commanders are perpetuated:—the DUKE OF CAMBRIDGE occurs once, SIR COLIN CAMPBELL once, CROMWELL once, HAVELOCK once, RAGLAN twice, and WELLINGTON, in various forms, eight times.

Of foreign commanders BLUCHER occurs once, CAPRERA—a synonym for *Garibaldi* of course—once, and NAPOLEON once.

It is perhaps worthy of note that no great military commander, of Devonshire birth, is commemorated. There is no sign, for example, in honour of Monk or Churchill.

The military victories which are perpetuated are CULLODEN, WATERLOO, ALMA, and SEBASTOPOL.

As might have been anticipated, rather more than one half of the “military houses” occur in the “three towns”—twenty-one at Devonport, eighteen at Plymouth, and ten at Stonehouse.

Comestible:—Apparently in recognition of the fact that man requires sustenance beyond that which he can derive from alcoholic beverages, there are seven BUTCHERS ARMS, four BAKERS ARMS, one OLD BUN-HOUSE, one TEA GARDENS INN, and one VICTUALLING OFFICE TAVERN.

Shoppy:—There seems no reason why sign-boards should be less or more likely than other things to “talk shop.” Accordingly, forty signs, distinguishing sixty-three houses, have this habit in a greater or lesser degree. Thus BARLEY CORN is met with once, MALTSTERS once, a MALTSCOOP four times, BREWERS once, a BREWERY once, a BREWERY TAP once, the VINE or GRAPES six times, a VINTNER once, and a VINTRY

once. The DEWDROP, encountered twice, so closely resembles the "Dew off Ben Nevis," which "Long John," the proprietor of a distillery near Fort William, was so famous for collecting, as to render it probable that its sign-board meaning is not simply a poetical one. It may be suspected that the FOUNTAIN and FOUNTAIN HEAD, which together present themselves thirteen times, are neither more nor less than large *Casks* or *Butts*. It cannot be pretended that the GOBLET, NEW BOTTLE, OLD BOTTLE, and PUNCH BOWL—each occurring once—are at all of doubtful meaning. There is something suspicious in being taken twice to BURTON, once to JAMAICA, once to MADEIRA, and four times to a CANTEEN; especially when we encounter BACCHUS once, a SAILOR or SAILORS eight times, and a WATERMAN once, and find them all JOLLY.

Financial :—The question of Ways and Means, though not ignored by our inn-keepers, is not thrust immodestly forward. They content themselves with devoting four houses to this service,—the REVENUE INN and the CUSTOM-HOUSE TAVERN at Plymouth, the CUSTOM-HOUSE INN at Exeter, and the BANK OF ENGLAND at Devonport.

Chromatic :—One hundred and thirty-one houses, having a total of forty-two distinct signs, hoist different colours—*White, Red, Black, Grey, Brown, Green, and Yellow*.

WHITE is decidedly the favourite, being displayed by sixty-eight houses—upwards of one half of the entire series,—and seventeen of the distinct signs. The following objects are stated to be WHITE :—BALL, BULL, CROSS, HART, HORSE, LION, PACK-HORSE, ROSE, SWAN, and THORN. The object most frequently painted white by the innkeeper is the HART.

RED stands second in the list, and boasts forty-one houses and five signs, displaying a RED LION, a RED DEER, and a RED COW; the first being the prime favourite.

OF BLACK there are twenty-three houses and nine signs, amongst which the BLACK HORSE is the great monopolist. There are also a BLACK BULL, DOG, LION, MOOR'S HEAD, SWAN, and SMITH.

BLUE is the colour of an ANCHOR six times, a BALL twice, and a BELL, BOY, and POSTS each once.

The other colours are but sparingly used, there being a BAY HORSE once, a BROWN BEAR once, a GREEN DRAGON six times, a GREY HOUND once, and a YELLOW ROSE once. It is possible, however, that the keepers of GOLDEN houses intended them to be regarded as *Yellow* also, in which case that colour

would be largely represented. The only *Yellow* sign mentioned by Larwood and Hotten appears to be a *Yellow Tree*.*

Sporting :—Sixty-two houses, having thirty-three different signs, appeal to the *Sporting World*. Forty-eight are devoted to *Hunting*, three to *Falconry*, three to *Fishing*, four to *Horse-racing*, three to *Driving*, and one, despising limitations, is the **SPORTSMAN'S ARMS**. Of those devoted to the *Chase*, six **HUNTERS** and one **HUNTSMAN** decline to state what they pursue. Twenty-seven find their attraction in the *Hare*, as may be inferred from the fact that their signs are **BEAGLES**, **GREYHOUND**, **HARE AND HOUNDS** or **HOUND**, **HARRIERS**, and **MERRY HARRIERS**. Eight devotees of *Reynard* make themselves known through the medium of **FOX AND HOUND**, **FOXHOUND**, and **FOXHUNTER**. In like manner, we have the **STAG**, **STAGS HEAD**, **STAG HUNTERS**, and **RED DEER**.

The only evidence of the ancient pastime of *Falconry* is the **FALCON** itself, which appears three times.

There is a total of six houses in the *Fishing* interest; but as the situation of three of them implies allusion to the serious business of earning a livelihood, the following are the only inns which can be said to encourage fishing as sport:—**FISHERMAN'S ARMS** in the parish of Ashton, the **SALMON POOL** in Alphington parish, and the **TROUT** at Axminster.

The **CHESTER CUP** at Plymouth and Stonehouse, the **FLYING HORSE** at Devonport, and the **RACE HORSE** at Tiverton, are unmistakable reminders of *Horse-racing*; and the desire which some men feel to hold the ribbons is suggested by the **FOUR IN HAND** and **TANDEM**,—both occurring at Plymouth, and the former also at Tiverton.

Titular :—One hundred and sixty-eight houses have signs bearing a title. **ADMIRAL** occurs four times, **BISHOP** twice, **DUKE** eighteen times, **EARL** once, **GRAND DUCHESS** once, **KING** fifty-nine times, **LORD** ten times, **LORD HIGH ADMIRAL** once, **PRINCE** thirty times, **PRINCESS** eight times, **QUEEN** twenty-nine times, **SOVEREIGN** once, **SIR** three times, and **SULTAN** once. The solitary **Earl** is **EARL GREY**, and the three **Knights** are **SIR COLIN CAMPBELL**, **SIR FRANCIS DRAKE**, and **SIR CHARLES NAPIER**.

Musical :—Though fifty houses apparently profess music, there is not much variety in the instruments or in the performers, since, excepting the **HARP AND LION** and **CAT AND FIDDLE**, there are but a **BELL** or **BELLS**, and their **RINGERS**.

* *History of Signboards*, p. 150.

Proverbial :—Two of our signs are derived from *Proverbs*. There can be no doubt that the BIRD IN HAND, at Devonport, South Huish, and Teignmouth, is an abbreviation of “A bird in the hand is worth two in the bush.” The sign appears to be very common, and is believed to be the landlord’s hint that there are decided advantages in ready money.

Again, LIVE AND LET LIVE, at Stockland near Axminster, and Staverton near Totnes, is no doubt an old saw intended to rebuke a greedy spirit.

Proprietorial :—Fourteen houses in the county take the names of their proprietors merely. With the exception of DOEL’S NUMBER ONE at Stonehouse, NAPPS INN at Berry-nabor near Ilfracombe, and Talbot’s TALBOT ARMS at Uplyme, they are all HOTELS.

Heads :—Thirty-one Devonshire inn-keepers, declining to take an entire animal, content themselves with a HEAD only. There is no instance of any other part or member being selected, except that of the HAND. The HEADS made use of are the KING’S and QUEEN’S, each five times; the TURK’S five times; the NAG’S, SARACEN’S and STAG’S, each twice; and the BLACKMOOR’S, BOAR’S, BULL’S, DUKE’S, POPE’S, and UNICORN’S, each once only.

There has been much speculation respecting the origin of the TURK’S HEAD and the SARACEN’S HEAD. The former has been supposed by some to have come in with coffee; others are of opinion that he owes his popularity to the terror he inspired in Europe throughout the fifteenth and two following centuries, which was so potent and prevalent as to induce Pope Calixtus III. to compose an economical and special protest and excommunication, good, at once, against the Devil, the Turks, and the Comet of 1456;* to justify the churchwardens of Abingdon in paying—“Anno MDLXV—8 of Q. Eliz.—for two bokes of common prayer agaynst invading of the Turke, 0. 6.;” and to secure the insertion of a clause in one of the earliest patents granted for pistols, to the effect that square balls were not to be used “except against the Turks.”†

In like manner, the SARACEN’S HEAD has been supposed to be an offspring of the Crusades; but some hold it to have

* See “A Cycle of Celestial Objects.” By Captain W. H. Smyth, R.N., K.S.R., D.C.L. Vol i. p. 231. 1844.

† See “History of Signboards,” p. 427, &c.

special allusion to the mother of Thomas à Becket, who was the daughter of a Saracen.*

It cannot be necessary to remind the proprietor of the BOAR'S HEAD, at Tiverton, that his house is the name-sake of one of the most famous houses in the History of Literature—the BOAR'S HEAD in Eastcheap, where, according to Shakespeare's Hostess Quickly, Prince Hal broke Falstaff's head, for liking his father to a singing man at Windsor; and where poor Francis was continually crying. "Anon, anon, Sir."

The BULL'S HEAD, at Devonport, also had a predecessor not unknown to fame. The artists' club, of which Hogarth was a member, used to meet at the BULL'S HEAD in Clare Market. A house in London having the same sign is mentioned as early as 1560.†

The DUKE'S HEAD seems to have seen a great deal of service in Britain. According to Larwood and Hotten, it has "always been applied to some ducal hero or other, for the time basking himself in the noon tide sun of fame. One of the first to whom it was applied, was Monck, *Duke of Albermarle* . . . then came *Ormond, Marlborough, Cumberland, York*, and, at present, *Wellington* and the *Duke of Cambridge*."‡

The NAG'S HEAD, at Barnstaple, and Gittisham near Honiton, cannot fail to remind all conversant with the History of Anglican Episcopacy, of the house bearing the same sign, formerly existing opposite Cheapside Cross, where, as the Roman Catholics state, Parker and the other Protestant candidates for the mitre consecrated one another. This story, however, is said to be utterly baseless.

Larwood and Hotten mention POPE'S HEAD, and the POPE'S HEAD;§—the former being the English poet, and the latter the Roman pontiff. The Devonshire POPE'S HEAD is the sign of a Beer House at Plymouth, and as the name reached me without the definite article prefixed, there seems little doubt that it is in honour of the author of the *Essay on Man*.

Though the authors just mentioned speak of the *Unicorn* as a sign, they give no instance of its *Head* being so used. The only example of it in Devonshire occurs at Berrynarbor near Ilfracombe.

Steam :—That *steam* should have impressed itself on the age, and not on its signboards, was scarcely to be expected. Accordingly, forty-six houses, having eighteen distinct signs, clearly show this impress, and the list is appropriately headed

* "Hist. of Signboards," p. 430, &c. † Ibid. p. 186. ‡ Ibid. p. 59.
§ See p. 67, and 312 *et seq.*

with the BRUNEL ARMS. The great engineer thus commemorated not only brought the railway system into the county, in which for some years his family resided, but, as has been already stated, he carried it thence into Cornwall by means of a bridge, which remains a proud monument of his skill. A LOCOMOTIVE INN is met with twice. Without descending to particulars calculated to offend partizans, a RAILWAY HOTEL, or INN, or HOME presents itself in twenty-nine localities. Four landlords, less cautious, show decided partiality, as they have opened HOTELS bearing the names of GREAT WESTERN, LONDON AND SOUTH WESTERN, SOUTH WESTERN, and SOUTH DEVON. Plymouth and Bideford have each a TERMINUS INN, but Tavistock alone has a STATION HOTEL. Devonport shows itself mindful of the STOKER, as it displays his ARMS, and has opened a house to celebrate his RETURN.

It has been already stated that the application of steam to Ocean navigation has not been overlooked; its claims being represented by eight houses.

Civilian :—Devonshire, though rich in sons who, though not warriors, have achieved distinction as men of thought or of action, does not appear to think the signboard a fitting medium for the transmission of their names to posterity. Neither Babbage, nor Buckland, nor Coleridge, nor Davis, nor Eastlake, nor Follett, nor Gay, nor Gifford, nor Gilbert, nor Hooker, nor Newcomin, nor Prout, nor Reynolds, nor Wolcot has been thus perpetuated. Nor does the fact appear to be explicable on the principle that a prophet is without honour in his own country; for ultra-Devonian British civilians fare but little better than those of the county itself. There is at most a total of twenty-two houses and twenty signs to do honour, either directly or indirectly, to the class just spoken of. Assuming the signs to have been all correctly interpreted, Statesmen take the lead. Two houses are dedicated to PALMERSTON, one to EARL GREY, one to RUSSELL, one to MOLESWORTH, and one to COLLIER. Poets come next, and, as undoubted chief, SHAKESPEARE commands four signs in honour of his own name, besides one as SWAN OF AVON, and two for FALSTAFF. The OLD AQUAINTANCE at Devonport, and POPE'S HEAD at Plymouth, refer probably to Burns and the "Twickenham Wasp." The Novelists are represented by KINGSLEY HOTEL, WESTWARD HO HOTEL, and UNCLE TOM'S CABIN. The CAXTON ARMS at Plymouth may, it is hoped, be in honour of the great printer. The semi-military outlawed ROBIN HOOD appears once in each of the "three towns."

Political :—Political signs are by no means numerous, and extend to no more probably than the statesmen just named—all of whom it may be remarked were liberals—the CARLTON at Devonport, CARLTON INN at Stonehouse, and REFORM INN at Barnstaple.

Chronometrical :—Two inns take their names from instruments for measuring time,—The CLOCK at Plymouth, and HOUR GLASS at Exeter. The innkeepers apparently object to a *Watch*.

Arithmetical :—Twenty-six signs, giving name to seventy houses, may be termed arithmetical. They include all the natural numbers from one to seven, descend to fractional quantities, and in a few instances employ *ordinals*.

The only instance of ONE is DOEL'S NUMBER ONE at Stonehouse.

TWO occurs twice,—the TWO MILE OAK and TWO TREES. The former is in the parish of Abbotskerwell, on the road from Newton Abbot to Totnes, *two miles* from the former, and has simply taken the name borne by an old oak standing very near it. The origin of the latter appears to be not only pre-historic but pre-traditional. The only thing that I can learn about it is, that its signboard formerly bore two trees, but when they faded, the words "Two Trees" were substituted for them.

THREE is the popular numeral, and is not at all times easily accounted for. The THREE ELMS in the parish of Brixham is the name of a way-side Inn, which, Mr. Bovey informs me, has three very old pollard elms in front of it, from which the name was derived. The house, he adds, was formerly occupied by three bachelor yeomen.

The THREE KINGS INN at Stonehouse is no doubt in honour of the Three Eastern Magi, who visited Bethlehem to do homage to our Saviour, and are known in legend as the *Three Kings of Cologne*. They naturally suggested the THREE QUEENS at Exeter, and the THREE CROWNS at Chagford. There seems to be no explanation for the THREE CRANES at Exeter, THREE PIGEONS at Bishop's Tawton, near Barnstaple, THREE HORSE SHOES, of which there are four examples, or the THREE TUNS, met with as many as seven times, unless we suppose the number to have some direct or indirect allusion to the doctrine of the Trinity, or to the very popular belief that "three are lucky." If the latter hypothesis be accepted, the THREE HORSE SHOES would present little or no

difficulty. It is as well known that a horse shoe is a powerful antidote to witchcraft, as it is that three is a lucky number; hence *three* Horse shoes would secure a large amount, if not the maximum, of happiness. It can scarcely be supposed that though a horse occasionally presents itself having three hoofs on at least one of its extremities—a partial reversion to the extinct three-toed horse of which palaeontologists write—that a monster of this kind suggested the sign of the THREE HORSE SHOES.

THE FOUR IN HAND at Plymouth and Tiverton, like the FOUR HORSE SHOES at Kentisbeare near Cullompton, require no comment; and the OLD FOUR CASTLES at Plymouth, rendered non-heraldically, are the "Plymouth Arms;" which, says Mr. Worth, are "Four castles sable, on a field argent, between a saltire vert." This is one of the oldest licensed houses in the town.

The only examples of FIVE are the FIVE BELLS at Ottery St. Mary, and FIVE OAKS in the parish of Inwardleigh. The former is simply a mystery. There were prior to 1553, four bells in each of the towers of its well known church, but since that date there has been a peal of six. The Rev. Dr. Cornish states that there is no custom or tradition touching the ringing of five bells there in a peal. The Rev. P. Gunning writes me that though there are no oaks there at present, the FIVE OAKS at Inwardleigh takes its name from five oak trees formerly growing round or near the public-house.

The SIX BELLS at Payhembury, derived as previously stated from the number of bells in the tower of the parish church, is the only instance of this numeral.

The SEVEN STARS, sometimes HOTEL, sometimes INN, but more frequently neither, occurs thirteen times, and is the only case in which the numeral is met with.

The HALF is the only fraction for a Devonshire innkeeper, who takes that portion of the MOON on twenty occasions, and is five times found keeping a HALF WAY HOUSE.

The *Ordinals* employed are the FIRST and LAST, and have been already mentioned.

Fable :—The FOX AND GRAPES, in the parish of Lifton, is the only Devonshire sign derived from a known fable.

Corporate :—Benefit and other societies have been the bases of a few of our signs. The FREEMASONS ARMS occur at Plymouth twice, and once in each of the adjacent towns; the ODD FELLOWS ARMS at Plymouth thrice, Devonport

twice, and Exeter once; and the MANCHESTER UNITY at Plymouth once. The DRUIDS ARMS at Plymouth, and GIPSY TENT at Devonport, may perhaps be also placed in this category. It is noteworthy that, with only one exception, the thirteen houses just mentioned are in Plymouth or the two adjoining towns.

Homiletic—It seems quite possible that a well-directed study of a judicious selection of our signboards might be morally beneficial. Who could cherish a feeling of envy in presence of the OLIVE BRANCH? Or fail at sight of OLD ACQUAINTANCE to be desirous of addressing a friend with—

“And here’s a hand, my trusty fiere,
And gie’s a haud of thine”?

Does not the sight of the WELCOME FRIEND pleasurabley remind us that it is our duty to “Welcome the coming, speed the parting guest?” Is not a study of the UNITY INN almost as beneficial as the well known lines—

“Whatever brawls disturb the street,
There should be peace at home;
Where sisters dwell and brothers meet,
Quarrels should never come”?

It is perhaps impossible to say what an amount of good may have been done by the threefold exhibition of FRIENDSHIP amongst us. It will no doubt go far to account for the fact that when men have drunk quite enough they have an unconquerable tendency to say, “Here’s my hand, and here’s my heart; and I love you like a brother.” Indeed, the statement that a man is “talking about his friends” is understood to be the equivalent of “he is sufficiently refreshed with alcoholic beverages.”

How must the plotter of mischief cower at sight of the GOOD INTENT or the HONEST HEART INN. The existence of a BEEHIVE in four different parts of our county must be productive of educational effects discoverable, no doubt, by a study of the police statistics before and after the setting up of this well known symbol of industry in the several localities. What a stimulus to the adventurous spirit so requisite in a densely populated country like ours, must there be in the BOLDVENTURE INN! And with what a bright steady hopefulness do the ANCHOR AND HOPE, met with three times, enable us to await the future! Should misfortune attend us, is not our duty taught us by the HEART OF OAK, of which there are three examples? Is it possible for any one to be

unduly grasping in sight of the motto, **LIVE AND LET LIVE?** or to be unmindful that, though it is his duty and privilege to provide for himself and for his the means of living, the world was not made for him alone? Finally, such a spirit of contentedness and gratitude breathes in **REST AND BE THANKFUL** as to suggest the probability that it inspired the poet when he wrote—

“Take the good the gods provide thee.”

It is but just to state that the three towns of which Plymouth is chief, contain thirteen of our twenty-two homiletic houses.

Astronomical :—The *Sun*, *Moon*, and *Stars* have, in various forms, given names to eighty-four houses; but *Planets*, *Comets*, and *Meteors* are utterly ignored. The *SUN*, as most popular, presides over thirty-three houses. It is observable that three out of every four of the sun-worshipping innkeepers bow to the *RISING SUN*, whilst only one solitary devotee has sufficient attachment to an old friend to prefer the *SETTING SUN*. This brave man has his house at Great Torrington, where, it is but fair to say, there is also a *RISING SUN*. Nine take the *SUN* just as they find it.

The *Stars* command thirty houses. The *STAR* occurs eleven times, *SEVEN STARS* fourteen times, *NORTH STAR* and *STAR OF THE WEST*, each twice, and *NEW STAR* once. It is, perhaps, doubtful which are the innkeepers' “Seven Stars”—the Pleiades, popularly held to be seven, or the conspicuous stars of *Ursa Major*, which really are that number.

The *MOON* occurs twenty-one times, and, so popular is half and half, in twenty instances it is the *HALF MOON*. Once only is her measure *FULL*.

Metallic :—The Devonshire innkeeper does not dislike *Gold*, as forty-one of his signboards show, but he utterly ignores all inferior metals. He seems to employ it chiefly in gilding the noblest of the *Felidae*, as he displays a *GOLDEN LION* twenty-eight times, once with the prefix *NEW* and once with *OLD*. He also exhibits a *GOLDEN FLEECE* eight times, and a *GOLDEN ANCHOR*, *GOLDEN BALL*, *GOLDEN CROSS*, and *GOLDEN EAGLE*, each once; and once, in honour of *Australia* probably, a *GOLDEN NUGGETT*.

Vehicular :—If by the *MAIL*, which occurs twice, a *Mail Coach* is meant, ten houses have what may be termed *vehicular*

signs. The COACH AND HORSES is met with seven times, and a HANSOM CAB once.

New and Old :—One hundred and seventy-two houses profess to be either NEW or OLD ; the former numbering one hundred and thirty-three, the latter thirty-nine, or almost exactly as 7 to 2. It was stated in an earlier part of this paper that the NEW INN occurs one hundred and four times, and is far the most popular sign in the county—a fact which says but little for the inventiveness of the innkeepers.

On collating the *Old* and *New* Inns, the following facts present themselves :—

1st. Several towns have two inns which in their signs differ only in one being OLD and the other New. Thus, Tiverton has an OLD BAMPTON and NEW BAMPTON, Ashburton an OLD BOTTLE and NEW BOTTLE, Exeter an OLD GOLDEN LION and NEW GOLDEN LION, Torquay an OLD LONDON INN and NEW LONDON INN, Teignmouth an OLD QUAY INN and NEW QUAY INN, and Bideford an OLD RING OF BELLS and NEW RING OF BELLS.

2nd. Certain towns have two inns of a given name, one stating itself to be OLD or NEW, whilst the other is silent on the question of relative age. Thus, Plymouth has an OLD LONDON INN and LONDON INN, Newton an OLD COMMERCIAL and COMMERCIAL, Southmolton an OLD BEEHIVE and BEEHIVE, Exeter a NEW COACH AND HORSES and COACH AND HORSES, as well as a NEW SHIP, SHIP, and SHIP INN, Exmouth a NEW EXMOUTH, and EXMOUTH, and Devonport a NEW GRANBY and GRANBY.

3rd. Certain towns have signs making a statement of relative age, without antithetical signs. Thus, Axminster has only an OLD BELL, Yarncombe near Great Torrington only an OLD BUN HOUSE, Torquay only an OLD CHURCH INN, Dartington near Totnes only a NEW CHAPEL INN, and Sidbury only an OLD FOUNTAIN.

The first category apparently presents no difficulty. It may be concluded, at least in a great majority of cases, that if in any town there are two inns differing in their signs only in one being OLD and the other NEW, the former is the older *inn*, but that its present sign is the more modern of the two. For it cannot be supposed that any house called itself OLD when making its first start. It was only on the opening of the rival house, which, endeavouring to combine the advantages of an established name and the love of novelty, took the sign of the Old house, with the prefix NEW for a differ-

ence, that in self defence it reminded its supporters, and informed the general public, that it was the OLD, the established, House. Thus, for example, the OLD BAMPTON at Tiverton is in all probability older than the NEW BAMPTON in the same town. Its original sign was no doubt the unqualified Bampton, which, on the upstart opening with its NEW and encroaching sign, it changed into the OLD BAMPTON in self defence.

When a town has two inns having the same sign, but one proclaiming itself to be NEW whilst the other is silent on the question, as the NEW SHIP and SHIP at Exeter, it may perhaps be concluded that the latter is the older inn, but that it was too well established, or too dignified, or too indolent to think of making any change when a rival appeared.

It is not easy to explain the reverse case, as the OLD BEEHIVE and BEEHIVE at Southmolton. We dare not charge the former with an untruth, nor suppose the latter to have been so unfair as to take the unqualified name of the older house so long as it retained it. Possibly it first called itself the NEW BEEHIVE, and thus goaded its venerable and unsuspicious competitor into the adoption of the prefix OLD, when it quietly dropped New and slid into the simple name, which, in the letter at least, had been abandoned.

When a town possesses an inn making an unnecessary display of its age or youthfulness, as the OLD BELL at Axminster, where there is no other Bell, we may suppose that the town formerly possessed two houses—a NEW BELL as well as the OLD BELL,—and that in their keen competition the former had to close; the latter might and probably would, retain its apparently meaningless prefix as a scar of honour.

It must not be forgotten that there are *New Inns* and *New Inns*, *Old Inns* and *Old Inns*. The proprietor of a *New Market Inn* may intend to convey the idea that his is an inn in honour of the *New Market*, whilst another with the same name may wish to signify that his house is a *NEW INN* in honour of a *Market* not necessarily *New*.

Biblical :—At least six of our signs are derived from the Bible. NOAH'S ARK and the OLIVE BRANCH, both occurring at Plymouth, recall the incidents of the Deluge, and it seems not improbable that the DOVE, of which there are three instances, is connected with the same event. The SALUTATION, of which we have three examples, originally represented the Angel Gabriel saluting the Virgin as described by St.

Luke i. 26, &c. Most persons in the present day have seen a signboard illustration of the name in which two hands are joined as in the act of shaking hands. At the SALUTATION HOTEL at Perth "a label is added with the words, 'You're welcome to the city.'"^{*} The ANGEL, borne by ten houses in Devonshire, is understood to be the same heavenly messenger;† and the THREE KINGS, as already stated, are the three wise men who came from the east.

The FIG TREE probably has reference to the text of every man "sitting under his vine and under his fig tree," and the HEN AND CHICKEN may have originated in the beautiful simile in the lamentation over Jerusalem. Matt. xxiii. 37.

PROVIDENCE INN is rather *Theological* than *Biblical*, as according to Cruden, the word occurs only once in the Bible (Acts xxiv. 2), and then not in the sense in which it is used by theologians. The PEACOCK, and UINCORN, thanks to certain mediæval legends, probably first appeared as Religious signs.‡

Saintly :—Three *Saints* only—ST. AUBYN, ST. GEORGE, and ST. JAMES—give their names to our signs. There are three of the first, all at Devonport; one of the second, at Stonehouse; and two of the third, at Plymouth. In short, each of the "three towns" monopolizes a saint, and no other town in the county is favoured with one.

Interrogative :—An inn in the parish of Bickleigh, between Plymouth and Tavistock, taking an interrogative sign, asks, WHO'D HAVE THOUGHT IT? but has forgotten to name the subject to which the question applies; thus leaving us ignorant of "what it's all about." Perhaps it was prophetic, and intended to ask, "Who'd have thought that any one would take the trouble to write a long paper on Devonshire signs?"

* See "Hist. of Signboards," p. 284.

† Ibid. p. 266, &c.

‡ Ibid. pp. 222 and 159.

ON THE ORIGINAL MAP OF THE ROYAL FOREST
OF DARTMOOR, ILLUSTRATING THE PERAM-
BULATION OF HENRY III., 1240.

BY C. SPENCE BATE, F.R.S., ETC.

(Read at Exeter, July, 1872.)

THE map which I purpose to describe and analyse is a curious old document. It has been submitted to Mr. Wyld, the well-known map-publisher, who, without having had time to complete his examination, thinks that it may be of the date 1240, or even earlier still. It is drawn upon sheepskin, two being fastened together across the centre. The length of the map is thirty-eight inches, and its breadth is twenty-seven.

Within the circle which marks the precincts of the Royal forest the map is painted yellow. All beyond is coloured green, except the rivers, which are white, longitudinally striped with blue. Some of the roads are black and white, and others are red and yellow. The churches are all of a reddish brown tint, the outline being definitely drawn in black.

The points of the compass are shown in yellow letters on a large pink or salmon-coloured circle; and a tablet in the corner is painted yellow, with a white border, adorned with black spots—ornamented on the top with a central scroll, supporting a human face; and in the same position at the bottom is a similar scroll, but no head. At each end there is a less ornate scroll. The index on the tablet is written in the old English square letter, while the reference letters are in the Roman type. All the names upon the map besides are in the old English character, excepting one word, and that is on the River Tavy. This corresponds in style to that of the writing used in the Perambulation, which is on the back of the map, a copy of which is given below.

The names are mostly on labels of painted scrolls. Some

few are written without labels, but these are chiefly the names of churches.

The writing and general work of the map that relates to the Forest is much more carefully executed than that beyond the Duchy limits, and some parts appear as if they had been executed after the map had been completed. In many places beneath the paint, lines can be seen which suggest the idea that the map has been corrected.

I presume from the date of the Perambulation that the map must be one of the oldest extant. There is in Hereford Cathedral one of near the same age. The following account of it, copied from *Handbook to the Cathedrals of England, Western Division*, p. 103, has been sent to me by Mr. G. Pycroft, may be of interest for comparison :

Description of an old Map of the World, preserved in the Library of Hereford Cathedral.

Here is preserved the remarkable *Map of the World*, which is one of the most valuable relics of mediæval geography. It was the work of a certain Richard of Haldingham and of Lafford (Holdingham and Sleaford in Lincolnshire), who has commemorated himself in the following verses :—

“Tuz ki cest estorie ont
 Ou oyront, ou luron, ou veront,
 Prient à Jhesu en deigté,
De Richard de Haldingham e de Lafford eyt pité
 Ki l'at fet e compassé
 Ke joie en cel le seit doné.”

The latter part of the thirteenth century is the date which has usually been assigned to it; but M. de Avezac, President of the Geographical Society of Paris, who has recently examined the map with much care, arrives, from internal evidence, at the conclusion that it was designed at the beginning of the year 1314. The map itself (drawn on thick vellum, and glued to a framework of oak) is founded on the mediæval belief that all geographical knowledge resulted from the observations of three philosophers (here named Nichodoxus, Theodotus, and Polictitus), who were sent forth by Augustus Cæsar to survey the three divisions of the world, when it was about to be taxed at the birth of our Lord. The Emperor is accordingly figured giving his directions to the philosophers. The world is represented as round, and surrounded by the ocean. At the top of the map, which

represents the east, is Paradise, with the tree of life, and Adam and Eve. Above is the last judgment, with the Virgin interceding for mankind. Jerusalem appears in the centre of the map, and near it the crucifix is planted on "Mount Calvary." Babylon has its famous tower. Rome bears the inscription, "Roma caput munda tenet orbis frena rotundi;" and Troy is described as "Troja civitas bellicosissima." (These four cities were regarded as the most important in the world. Troy in the twelfth and thirteenth centuries was a favourite subject of romance.) The British Isles occupy a considerable space; and Hereford, with its cathedral, is by no means obscurely placed. A great part of the map is filled with inscriptions taken from Solinus, Isidore of Seville, and others; and with drawings of the monstrous animals and peoples which the mediaeval cosmography supposed to exist in different parts of the world. The monkey is assigned to Norway, the scorpion to the banks of the Rhine, and the "oroc" (aurochs) to Provence. Lot's wife, the labyrinth of Crete, the columns of Hercules, and Scylla and Charybdis, should also be noticed. "The portrait of Abraham is seen in Chaldea, and of Moses on Mount Sinai. Amid the deserts of Ethiopia St. Anthony is recognised, with his hook-beaked satyrs and fauns. St. Augustine, in his pontifical habit, marks the situation of his own Hippo."

The history of this very remarkable map is uncertain. It was discovered, probably about a century ago, under the floor of Bishop Audley's Chapel; and Dean Merewether suggested (but apparently without the slightest authority) that it might have served originally as an altar-piece.*

* For a further notice of this map see Mr. Wright's paper in the Gloucester volume of the Archaeological Association, and that by M. D'Avezac, already mentioned. One of the earliest mediaeval maps accompanies the text of the "Periegesis" of Priscian, an Anglo-Saxon MS. of the end of the tenth century. (Cott. Lib.) "A map of the world, in a MS. of the thirteenth century in the British Museum, contains a curious note, in which the author refers to four maps which were then looked upon in England as being of chief authority. These were, the map of Robert de Melkeleia, that of the Abbey of Waltham, that in the King's Chamber at Westminster, and that of Matthew Paris."—WRIGHT.

the otn. side is graven, Koolande.

Johnes. Com. Moreton Ombus. Hominib. et amicis suis Francie
et Anglie Pntib. et futuris saltm. Sciatis me concessisse redi-
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*Perambulation, 24 Henry III., 1240. Printed from the copy
on the back of the original Map.*

Hec est Perambulato. facta per Coe. Consilm. Rici. Comitis Cornubie et Pryttanie in Com. Devon. p. preceptu. dni. Regis Henrici filij Regis Johis. anno coronacionis sue vicesimo quarto. In vigilia sancti Jacobi apli. p. sacrm. militm. subscriptoru. scilit. Willi. de la Bruwer, Guydon de Brytteuile, Willi. de Wydeworthy, Hugonis de Bolley, Rici. Gyffarde, Adonis de Breverlyn, Henric. filius, Henr. Willi. Trencharde, Phillipi Parer, Nichi. de Heamton, Willi. de Morleghe, et Durante Filij Bot qui incipiunt perambulacem ad hogam de Cosdonne, et inde Linialit. usq. ad parva hogam que vocatur parva Houndetor, Et inde Linialit. usq. ad Thursleston Et inde Linialit. usq. ad Wotesbrokeslakesfote que cadit in Teigne, Et inde Linialit usq. ad Heighestone, Et inde Linialit. usq. ad Langstone, Et inde Linialit. usq. p. medium Turbaria de Alberyshede. Et sic in Longu. Wallebroke. Et inde Linialit. usq. ad ffurnm. Regis. Et inde Linialit. usq. ad Wallebokeshede, Et sic in longum Wallebroke usq. cadit in Darta; Et sic per Dartam usq. ad aliam Dartam. Et sic p. aliam Dartam ascendendo usq. Okebrokysfote. Et sic ascendendo Okebroke usq. ad la Dryaworke. Et ita ascendendo usq. ad Dryfeldforde. Et inde Linialit. usq. ad Cattishille, Et inde Linealit usq. ad Capud de Wester Wellebroke, Et sic per Wester Welbroke usq. cadit in Auena. Et inde Linialit. usq. ad Yester Whyteburghe. Et inde Linialit. usq. ad la Redelake, ubi cadit in Erme, Et inde Linialit. usq. ad Grymesgreve. Et inde Linealit. usq. ad Elysburgh Et sic Linialit. usq. ad Crucem Sywardi, Et inde usq. ad Ysforther, Et sic p. aliam Ysfother, Et inde per medium Mystor usq. ad Mewyburghe, Et inde usq. ad Lullingesfote, Et inde usq. ad Rakernebrokysfote, Et sic ad capud ejusdem aque, Et deinde usq. ad la Westsolle, Et inde Linialit. usq. ad Ernestorre, Et inde Linialit. usq. ad vadum proximi in orientali pte. Capelle Sci Michis de Halstock, Et inde Linialit. usq. ad pdcam. hogam de Cosdonne in Orientali pte.

hit is to be noatid that on the one syde of the crosse abouesaid their is graven in the stone Crux Siwardi, and on the oth. side is graven, Roolande.

Johnes. Com. Moreton Ombus. Hominib. et amicis suis Francie et Anglie Pntib. et futuris saltm. Sciatis me concessisse redi-

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disse et hac carta mea confirmasse comitib. baronib. militib. et ombs. libe. tenentbs. clericis et laicis in Devon libertates suas foreste quasi habuerunt tempe. Henrici Regis pavi. mei. Habend. et tenend. illis et heredibus suis de me et heredibs. meis. Et noitm. quod heant. arcus pharetras et sagittas in terris suis disserend. extra reguardm. foreste mee et quod canes sui vell Homim. suoru. non sint espaltati extra reguardu. foreste. Et quod heant. suas et alias libertates sicut melius et libius. illas habuerunt tempe. ejusdem Henrici Regis et Reisellos suos et quod capiant caprelum, vulpem, cattum, lupum, leporem, lutr. ubicunq. illa invenerint extra reguardm. foreste mee. Et ideo vobis firmit. pcipis. quod nullus eis de hijs vell alijs libertatib. suis molestiam inferat vell gravamen. Hijs Testibs. Willo. Marescall, Willo. Com. Sar, Willo. Com. de Vern, Stephano Ridell Cancellario meo, Willo. de Wenn, Hamonde de Valoin, Rogero de Novoburgo, Ingel. de Prasells, Roberto de Mortem, Waltero de Maltrever, Radulpho Morym, Waltero de Cauvelo, Felcon fratre suo Gilberto Morin et multis alijs.

Henricus Dei Gra. Anglie Dinis. Hibnie. Dux Aquitanie et Comes de Andeg. archiepus. epis. Pnonb. com. baron. justus. foreste vics. prepostis ministris et omnibus alijs fidelibus suis saltm. inspeximus castam quam Dinis. Johis. rex patris noster fecit omnibus hominib. de tota Devon in hæc verba: Joes. Dei Gra. Rex Anglie, Dux Hibernie, Dux Normand, et acquitan. comes Andeg. Archiepus. Epis. Abbatib. Pnonbus Com. baronib. justics. foreste vics. Ppostis. ministris et omnibus alijs fidelibus suis saltm. Sciatis nos deafforestasse totam Devon de omnibus qua ad foreste ptinet. usq. ad metas antiquoru. regardore. de Dartemore et Exmore que regaro fuerunt tempe. regni Henrici primi. Ita quod tota Devon et Ones. in ea manentes et heredu. eoru. sint deaforest. et quiet. et solut. de nobis et hereduiis imperpetuum de omnibus que ad forestam et ad Forestar. ptinent. except. duas Moris prominat. (scet.) Dartemore et Exmore p. pdcas. metas Volimus et concedimus quod pdcos. Hores de Devon. et Heredu. eoru. habeant consuetudo infra reguardu moram. illaru. sicut habere consueverunt tempore pdci. Regis Henrici faciend. inde consuetudines sicut tunc inde facere consueverunt et debuere. Et quod liceat eis qui volunt extra pdcas. metas essartare forstallas pçose. facere omnid. ventat. capere canes et sagitt' omnid. arma here. et Saltatoria facere nisi in diversis pdpearu. moram. ubi non pot'unt sal-tator vel Haias facere. Et si canes eorum excurser. in

foresto uro. Volum. quod ipse inde deducant^r "sicut alij Baron et Militis inde deducant^r" qui sunt de Foresto et qui marchnat alibi Foresto uro. Et voluns quod unus Turns. Vics. tant. fiat semel in anno in Com. Devon. faciend et quod plures tuos. non facit nisi in felit Corone eveniunt^r attachi undis cum coronatoir. et prop pace assecurundu. Ita quod in Ino. illo nichill capiat ad opus suu. de Psonibus. vero qui capti sunt in Devon de quib. vic. heat. Potestatem eos. Replegrandu. et quoru. Pleges Com. Devon. volunt super se cape voluim^s et concedimus quod P. Consilium coras replegiunt^r. Ita quod pro eodem michell accom. sicutlutes in psona. non Delinent^r. Et si vice. injuste Gravaver. p. dcos. Hores. et inde Convict. fueritis incident in manu nostra et nos de eo Miam capiemius et aliu. vics. ei substitutem qui eos bene et legalit. tractabit.

Teste Dno. Rogero Saru. Epo. Guffredo Fillio Joelis Com. Essec, Baldewino Com. de Albamoor Com. de Ferrar, Henric. Com. de Herford, Willo. de Vrace, Hugon de Nerall, Willo Preweir, Simon de Paddyhill, Dat p. manus Dni. S. Anno Regni mi. Quinto Cicest^r Elect. apud Winton 18^o die Maij. Autem concessionis p. dcas. pat. hint. et grat. eas pro nobis et Heredibus uris. concessimus confirmavimus sicut carta p. dci dni. Johis. Regis Patris uro melius plenius et liberius Testat^r Hijs Testebus venerabs. Patre Robert Eborus Archepo. Anglie Primat, Petro Saband uro Willo de Kilkenny Covene Archid, Rico de Spiy, Rogero de Crey, Roblo de Luinsteur, Gilberto de Sogoe, Robert Walrond, Barth Pall, Robert de Norreys, Willo de Chenny, Johis. de Gerrys et alijs dat p. manum meam apud Vindesorr 20^o die aprilis anno Regni mi. 36.^o

Memorandum. qd. Iohis. quandam Rex Anglie Dedit Huberto Vans Dno. de Uggeburghe pro servicio suo Comunem et libertatem in Foresto de Dartmore et ombs. tenentibus suis in Uggeburgh cu. ombs. Gtmbs. Aniliu. in pdco. Foresto luntibus videlicet in Bosti. in Pratis et in turbar. in carbon, in fristu, et in heth pro servicio suo quinq. Denarios Dno. Rege Anglie solvendu. Amicatant (?) in festo Sete Iohis. Baptiste in Mannerio de Uggeburgh et Leighwill. Tendendu et habend. omnia sup. dea dict. Hubert Vans, Heredibs. et Assign^s suis et ombs. tenentib. suis de Manu. eo de Uggeburghe in ombus. suis p otijis, et Leblatchis p dco. foresto de Dertemore et alijs potijs. dato apud Eboru. in tempore pdicti. Iohis. anno septimo.

*Perambulation of Dartmoor Forest, 24 Henry III., A.D. 1240.
Extracted from Risdon's Survey of Devon.*

Perambulatio Richardi comitis Cornubia et Pictavia tenentis in com. Devon. per præceptum domini regis Henrici filii, Johannisi coronationem dict. Hen. 240. in vigilia St. Jacobi per juramentum sacrusti subscript scil Will. de la Bruer, Guidonis de Bretivile, Wil. de Widworthy, Hugonis de Bolhay, Rich. Giffard, Odonis de Treverby, Henricus filius Henrici Wil. de Trenchard, Phil. Harrer, Nich. de Heamdon, Will. de Northleigh, et Durat filii Boton, qui incipiunt perambulationem, ad Hogam de Cosdowne, et inde linealiter usq; ad parvam Hogam, quæ vocatur Hounterset, inde usq; ad Thurleston, et inde linealiter usq; Wotesbroke, Lakefoot, que cadit in Teigne. et inde linealiter usq; ad Hangeston, et inde linealiter usq; ad Gotestone, et inde linealiter usq; at median Turbariam Aberhene, et sic in Longam Wallabroke, et inde linealiter usq; ad Surt. regis, et inde linealiter usq; ad Walbroke-Head, usq; cadit in Darta et sic per Dartam, usq; ad aliam Dart. ascendend. usq; ad Abbot-Foot, et sic ascend. Otbroke, usq; ad Ledeereoke; et ita ascendend. usq; ad le Drifeildforde, et inde linealiter usq; at Batshill, et inde linealiter usq; ad caput de Westor Wellabroke, et sic per Wester Wellabroke usq; cadit in Avon; et inde linealiter usq; ad Easter-Wellabroke; et inde linealiter usq; ad Redlake, que cadit in Erme, et inde ascend. usq; ad Grimsgrave, et inde linealiter usque ad Ellisborough, et inde linealiter usque ad crucem Silward, et inde usq; ad Efforther; et sic per aliam Efforther, et inde per medium mistum usq; ad Mewboron, et inde usq; ad Willingsesse, et inde ad Rahernbroke-Foot, et sic ad caput ejusdem quæ et deinde usq; ad Le West Soll, et inde linealiter usq; at Grenestor, et inde linealiter usq; ad vadum proximum in orientali parte cappellæ St. Mich. de Hallgestock, et inde linealiter usq; ad ad prædict. Hoentali paowne, in orientali parte.

Perambulation of the Boundaries of Dartmoor Forest, 24 Henry III., A.D. 1240.—Extracted from Rowe's Dartmoor.

Hec est Perambulatio facta et ordinata per commune consilium Ricardi Comitis Cornubie et Pictavie et militum et libere tenentium in comitatu Devon per preceptum domini Regis Henrici filii Johannis anno coronationis dicti Henrici vicesimo quarto in vigilia sancti Jacobi apostoli per sacramentum militum subscriptorum, scilicet, Willielmi de la Brewer, Guidonis de Bretevyle, Willielmi de Wydeworthy, Hugonis de Bollay, Ricardi 'Gyffard', Odonis de Treverbyn, Henrici filii Henrici, Willielmi Trenchard, Philippi Parrer Nicholai de Heamton Willielmi de Moreleghe, et Duranti filii Botour, qui incipiunt perambulationem ad hogam de Cossdonne et inde linealiter usque ad parvam hogam que vocatur parva Hundetorre, et inde linealiter usque ad Thurlestone, et inde linealiter usque ad Wotesbrokelakesfote que cadit in Tyng, et inde linealiter usque ad Heighestone, et inde linealiter usque ad Langestone, et inde linealiter usque per medianam turbariam de Alberyshoved, et sic in longum Wallebroke et inde linealiter usque ad Furnum regis et inde linealiter usque ad Wallebrokeshede et sic in longum Wallebroke usque cadit in Dertam, et sic per Dertam usque ad aliam Dertam, et sic per aliam Dartam ascendendo usque Okebrokysfote et sic ascendendo Okebroke usque ad la Dryeworke, et itsa ascendendo usque ad la Dryfeld ford, et sic inde linealiter usque ad Battishull et inde linealiter usque ad caput de Wester Wellabroke et sic per Wester Wellabroke usque cadit in Avenam, et inde linealiter usque ad Ester Whyteburgh et inde linealiter usque ad la Redelake que cadit in Erme et inde linealiter usque ad Grymsgrove et inde linealiter usque ad Elysburgh et sic linealiter usque ad crucem Sywardi et inde usque ad Ysforther et sic per aliam Ysforther et inde per medianam Mystor usque ad Mewyburgh et inde usque ad Lullingesfote et inde usque ad Rakernesbrokysfote, et sic ad caput ejusdem aque et deinde usque ad la Westsolle et inde linealiter usque ad Ernestorre et inde linealiter usque ad vadum proximum in orientali parte capelle Sancti Michaelis de Halgestoke et inde linealiter usque ad predictam hogam de Cossdonne in orientali parte.

The Presentment of the Jury at a Survey Court for the Forest of Dartmore, A.D. 1609.—Extracted from Rowe's Dartmoor.

At a courte of Survey holden at Okhampton in the countie
of Devon the xvith daye of August in the sixth yere of the
raigne of our most gratiouse Sov'reigne Lord James by the
grace of God of England France and Ireland Kinge Defender
of the fayth &c. and of Scotland the forty second, before Sr.
Willm. Strode Knight, Richard Connocke Esquire Auditor of
the Dutchie of Cornwall, Robt. Moore Esquire and Robt.
Paddon Gent., Comissioners by virtue of a comission from
his said Ma^{tie}. to them and others directed bearing date the
daye of in the ffyvth yere of his said
Ma^{tie}. most happie Raigne concerninge the Survey of divers
honors castles manors messuages lands tenement^s fforestes
chases parks and other proffits belonging to the said Dutchie
of Cornwall as by the same Comission under the great seale
of England more at lardge doth and maye appere; The jurors
then and theretourned scil^t Edward Skirrett, Walter Hele,
Roger Cole, Henrie Burges, Richard Edmond, Gregory Gaye,
John Bickford, Hugh Elford, John Masye, Roger Drake,
Walter Lillierappe, John Chubbe, Stephen Taverner, Andrew
Haywood, Roger Wickett, Will^m. Searell, Rob^t. Hannaford,
John Willes, John Hele, Walter Tookerman, Will^m. Mudge,
William Ilbert, Thomas Turges, Ellies Harryes and John
Parnell, all w^{ch}. being sworen to enquire of the boundes and
limitts of the Forrest of Dartmoore and of all such p^{son}. and
p^{sons}. as have interest of com'on there and wth. what beastes
and at what tymes and seasons and what other com'odities
the same p^{son}. and p^{sons}. may usuallie have and take wth. in
the said fforest and mannor of Lidford and what profits and
com'odities doe from them yerelie come unto his ma^{tie}. and to
the Lord Prince for the same—And lykewise what other
landes and tenement^s. royalties rightes, estrayes and proffits do
belonge unto his said ma^{tie}. and Lord Prince lyinge adjoininge
and nere to the said Forrest and what right title or occupacon
anie p^{son}. or p^{sons}. do clayme or ought to have of and in the
same and what yerelie proffits do arrise and growe out of the
said landes and lykewyse what offences trespasses and mis-
demeanures are com'itted and donne wth. in the said Forrest
and lands and by whom: The said jurors uppon good testy-
monie showed them witnesses sworne, and uppon their own

knowledges do p'sent upon the'r oathes as followeth: FFIRST they p'sent that the bounds of the fforest of Dartmoore as they the said jurors do fynde partlie by the coppies of auncient recordes p^{tie} upon the evidence of other p'sons and partlie upon their owne knowledge but especiallie as the boundes have beeene and are used and accustomed to be these as follows.—Beginning at a high hill lying in the north quarter of the said fforest called at this day Cosdon al's Cosson, and in the old records written Hoga de Costdonne and from thence lineallie eastward by estimacon one mile or more unto little houndetorr w^{ch} in the said records is called (hoga de parva houndetorr) and from thence lineallie to a place named in the said records Thurleston, now as they suppose called Waterdontorr being about three quarters of a myle from Houndtorr aforesaid, and from thence near a myle to Wotesbrookelake foote w^{ch} falleth into Teynge and w^{ch} lake they thincke to be the same w^{ch} is now called Whoodelake, att w^{ch} place they accompt the North Quarter to end; and from thence nere one mile to Hingeston, al's Highstone, in the east quarter lyng near ffernworthie hedges, and from thence lineallie nere one mile to Yeston, al's Geston, now com'onlie called Hethstone, and from thence lineallie thorough a fenny place now called Turfehill, but named in the old records per mediam turbariam de Albereeheved, to a place called Kinge's Oven and in the said Record namely Furnum Regis, and from thence to Wallebrookeheade and so alonge by Wallebrooke until it fall into easter Dart and so downwards by the said easter Dart to another Dart called wester Dart and from thence ascendinge by the said west Dart unto Wobrookefoote wher the east quarter endeth; and from thence linyallie ascendinge to Drylake, al's Dryeworke, and from thence ascendinge by Drylake unto Crefield fford or Dryfeild ford and from thence to Knattleburroughe, w^{ch} they take to be the same that is called in the old records Gnatteshill, and so from thence descending linyallie to Wester Wellebrooke headd and so by the same Wester Wellebrooke until it falleth into Owne, al's Aven, and from thence linyallie to Easter Whitaburrowe and from thence liniallie to Redlake foote whir it falleth into Erme, and from thence liniallie ascendinge unto Arme headd, w^{ch} they take to be a place named in the said records Grimsgrave; and from thence to Plimheadd, where the South quarter endeth; and from thence linyallie to Elisboroughe and from thence linyallie to Seaward's Crosse and from thence linyallie to little Hisworthie and so from thence linyallie to another Hisworthie and

so from thence linyallie through the midst of Mistorr moore to a rocke called Mistorpan, and from thence linyallie to Dedlakeheadd w^{ch}. they thincke to be the next bound w^{ch} is called in the old records Meuborough, and from thence linyallie northwardes to Lunesborowe, w^{ch}. they thincke to be the same that is called in the records Lullingesete, and from thence linyallie to Wester Redlake between w^{ch} said two bounds the wester quarter endeth ; and from thence northward to Rattlebrooke foote and soe from thence to the headd of the same Rattlebrooke, and so from thence linyallie unto Steinegtorr and from thence linyallie to Langaford, al's Sandyford, and so from thence linyallie to the ford w^{ch} lyeth in the east syde of the chapple of Halstocke and so from thence linyallye unto the said hill called Cosdon, al's Cosson, wher they did begin.

Devon and Cornwall were disforested by Henry III. by Charter, and a Perambulation defining the Royal limits was made in 1240. Several copies of the Charter were executed, of which I have been able to see three—one published in Risdon's *Survey of Devon*, one in an Appendix to Rowe's *Perambulation of Dartmoor*, and one on the back of an old map, to which I wish now to draw attention.

The map has the peculiarity of not attempting to be exact ; but is evidently drawn upon a plan which was probably most capable of being understood at the time.

Distances and form are not attempted with precision ; but only relatively in regard to other things and places. Yet with all this cumbersome arrangement there is a definite method in the scheme that, with a little study, shows the whole to be wonderfully consistent with the topography of the district.

All objects, such as hills, marshes, or tumuli, are defined, when they are recorded on the map, by a circle. Boundstones or pillars are figured to rudely represent a rough unhewn stone. Rivers are drawn so as approximately to resemble a stream ; they are painted white within black margins, and have the water shaded off with blue longitudinal lines.

The rivers are only drawn so far as to indicate their relation to the forest. When they form part of the boundary, they are drawn so as to correspond with the circle that represents

the imaginary outline of the Duchy property; as may be seen in Rakernsbroke, Western Wellabroke, Okysbroke, the Wellabrook on the Dart, and the Wellabrook on the Teign. When they are not available in defining the limits of the forest, they either fall short of the circle or pass directly within it, and are drawn without any reference to their natural importance. Thus the Okebroke, with its insignificant moorland tributaries, is drawn greater in length than either of the Darts. Neither of these last are shown to pass much beyond the boundary of the forest, and the two northern rivers, the Ockment and the Taw are not represented. Both of these last take their rise within the forest boundary, and from the same fountain-head as the Dart.

The map was evidently projected by persons who had more interest in or knowledge of the southern than of the northern district of the county. The plan of the forest is pourtrayed so near to the top of the map, that there is little room for anything to be inserted above it. On the western side nothing is shown north of Lydford Church; and on the eastern, nothing beyond Brent Church; while from Brent to Lydford most of the important places are delineated.

Conventional as the entire plan of the map is—all idea both of size and perspective being entirely ignored—yet the relative position of one place in respect to another is correct, and demonstrates, for all practical purposes, the map to have been an efficient document.

Hic incipit perambulatio. The Perambulation commences with these words, painted on a white label, as are also all the names that define the forest bounds, and many others of the more important places. The ends of the labels are ornamented by flourishing scrolls drawn according to the taste of the draughtsman.

HOGA DE COSDONNE is the first place named. It is next to ^{Cosdonne.} the loftiest hill in Devonshire; and at a time when instruments were unknown it might easily be thought to be higher than East Willhayes. Cosdon is written in Rowe and Risdon Cosdonne (1240). It is said, in the Survey of 1609, to have been called Cosdon, also Cossom, at that time; and it is written Cawson or Cosdon Hill in Rowe's map, and Cawsand or Cawsorn Hill in that of the Ordnance Survey.

Cawsan, as it is now most frequently called, is 1802 feet above the level of the sea, or about 250 feet less than East Willhayes, near Yestor; but from the abruptness with which it rises direct from the marshy land of the valley it has, when

approached from either side, a more mountainous appearance than the Devonshire tors generally possess.

Rowe, in his *Perambulation of Dartmoor*, 1830, says, "I have been unable to ascertain the exact point referred to by the original Charter under the name of Hoga; but we may conclude that it could not have been far from the banks of the Taw, in the immediate neighbourhood of Sticklepeth."

What Mr. Rowe expected to find is difficult to determine; but I believe I am correct in asserting that Hoga is but the Scandinavian name for a hill—a hill probably connected with some important event.

In an article on "The Pagan State of Ireland and its Remains," published in the *Dublin Magazine* for August, 1870, I find it stated that "three of the barrows about Upsal, in Sweden, are called Kong's Hogarn, or King's High Cairn. These kings' barrows are traced back to an origin not very remote from Odin." And in a note appended to this paragraph the author remarks, "This seems a hybrid word; Hoch or Hog in German, is mons, collis. Spellman in Hoga: and cairn, Irish, a heap of stones. The Swedes call those hills on which their kings were crowned, Krenanhoga."

On the top of the hill are monumental relics of various kinds. Most of the Dartmoor tumuli are cairns formed by stones, heaped together without any respect to place or arrangement; but one of these barrows on Cosdon is a low flat mound, surrounded by stones placed on their end and sloping outwards.

The barrow has the appearance of having been broken into at the centre, but not to such an extent as to suggest the idea that it has been much interfered with. A kistvaen that once was protected by a cairn of stones lies south-west of it. The cairn has been broken into, and the kist rifled of its contents. The Rev. S. Rowe mentions two other monuments, one of which is "seventy yards W. S. W. of the last. Within the area of a circular enclosure, formed of slabs set closely together, being fifty-four feet in diameter, is a dilapidated kistvaen, eight feet square, and apparently exhibiting traces of an inner coffin, or sarcophagus, the coverstone of which is not more than two feet and a half broad."

"Somewhat more than a hundred yards N.E. by N. from the kistvaen last described, is a circular enclosure totally different from the former, as the stones of which it is composed are small and pebbly, and irregularly heaped together, forming a sort of miniature *Pound*."

These several records afford strong evidence that this hill

was held in much repute in the early occupation of the land, and it is not improbable, as the terminal syllable of the word signifies a hill or fortified place, that the first syllable may have been taken from the name of some illustrious chief or warrior who occupied or was buried on it.

From Cosdon the line of the perambulation goes to "Parva ^{Parva} Houndetor." Hogam," which is called PARVA HOUNDETOR in the description, but written Howndetorre in the map. In Risdon's copy of this same survey it is called Hounterset, and in Rowe's copy it is written Hundetorre. In the Survey of 1609 it is called Little Houndetorr, and in the Ordnance Survey Houndtor. The derivation of this word has not been determined. There is another Hountor near Manaton. Honeybag Tor no doubt comes from the same root.

The commissioners of the Survey of James I. (1609) say that Little Houndetorr lies by "estimacon" one mile or more eastward of "Cosdon, al's Cossom." It would appear from this that the hill which at present bears the name of Houndtor cannot be the one that was intended to bear it when the survey was made. Instead of lying eastward, the Tor in the ordnance map that bears this name is a little to the west of the meridian of Cosdon, and about two miles south.

It will be noticed that in the earlier descriptions this place, wherever it may be, is spoken of as "Parva Hogam," or the "Little Hill." From a study of the place itself, aided by the ordnance map, I can recognise no place that answers this description so much as Shelstone. This hill, according to Rowe, is likewise surmounted by tumuli, from which we may suppose that it may have derived the unusual cognomen of "Hoga." But the line of the Perambulation is still more thrown out when it proceeds to

THURLESTON (MS.—Risdon.—Rowe). In the Survey of Thurlestone. 1609 this Tor is said to be "lineallye about three quarters of a myle from Houndtorr," "now, as we suppose, called Waterdowntorr," which is also believed to be the same as that marked in the maps of this present time as Watern Tor.

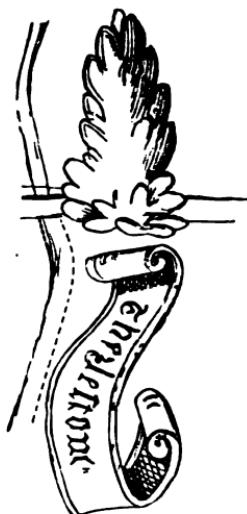
In the ancient map which we are now analysing the place is called Therlestone; and the word Tor does not appear in any of the several copies of the Perambulation of 1240. We find it used for the first time when there is an attempt to identify it with Waterdon Torr in 1609. In the old map, whenever a hill or tor is mentioned in the boundary line, the place is indicated by a circle. But in this instance the place is described by a drawing of a huge unwrought upright stone, surrounded by smaller ones at its base; thus suggest-

ing the circumstance that a maenhir or upright stone was the object that marked this point in the forest bounds. Support is given to this idea from the fact that the next two points in the Perambulation are also called "stones," and these are known to be upright pillars associated with relics of unrecorded antiquity.

To define this point in the original Perambulation would be of interest in a historical point of view, and valuable as defining the original limits of the forest bounds.

There is no reason whatever, so far as I can ascertain, for the assumption that Thurlstone was intended for Waterdon Tor, particularly as they say that the place preceding it in the boundary was eastward of Cosdon. Waterdon Tor is nearly two miles south of Hound Tor, thus making both places westward of the meridian of Cosdon. In the Survey of 1609 Waterdon Tor is said to be three quarters of a mile lineally from Hound Tor. In the original Perambulation distance is not mentioned.

South, but bearing a little to the east of Shelstone Hill, which I suggest most probably was the original "Parva Hoga," or little hill of Hound Tor, is one of the most important of the so-called Druidical circles on the moor. Most of the stones are still standing, and among them is one towards the western extremity that I take to have been the boundary mark



Part of the Sacred Circle near Scorhill Tor.

alluded to under the name of Thurlstone. This stone is considerably taller than the rest, and I contend that the

figure in the old map represents the upright rude stone, and the smaller ones at the base the circle that surrounds it.

The Rev. Isaac Taylor, in his work on *Words and Places*, associates the name of the Scandinavian Thor with that of Thurshelton on the Thrustle, a tributary of the Tamar.

It would be a curious and interesting circumstance if we could, through the means of this ancient map, identify the sacred circle under Scorhill Tor with the name of Thurlstone, and through the etymology of the word show it to have been associated with the worship of the Scandinavian God Thor.

I think it not impossible that by the aid of old records the identity of Thurlstone with the high stone situated among those in the circle may be established, if it be true that it was originally the case.

There is an ancient road marked in this map that crosses the moor from Tavistock. Passing over Merrivale Bridge, it enters the forest between Mystor and Hessary Tor somewhere near where the present turnpike road lies. It turns away, however, to the north, and, leaving Mystor on the left, it goes by the head of the Walkham, as well as the head of the Tavy, which it leaves on the left, quits the forest at the north-eastern side of the moor between Hound Tor and Thurlestone, and then goes on in a direct line to the edge of the map. The line of this roadway must have traversed the moor very close to several of these sacred circles, and the position of the old stone bridges over the Teign and the Wallabrook, opposite to the circles of Fenworthy and Scorhill, are suggestive of their being in connection with it. That is, supposing the road in the old map corresponded more or less closely with one of prehistoric times.

On the map the road lies nearly east and west, and we have a right to assume that its general bearing was somewhat in that direction. As the road passed out of the map on the northern side of the Teign, it cannot have led to Chagford, which is on the southern side. It probably went to somewhere near Gidleigh, and in so doing the most direct route would be by the ancient bridge over the Wallabrook.

To my conviction, the evidence that Thurlstone is associated with Scorhill circle is more satisfactory than that it can be identified as being Watern Tor.

In proceeding on the boundary, the line passes over the Teign just at its junction with the Wotesbrokelake. The river is drawn as two branches, one of which is called the TENGE, ^{Teng} and evidently is that now known as the North Teign, and

the other the Wotesbrokelake, which I believe to be that now called the Wallabrook.

The root of the name of the Teign is very difficult to determine. The Rev. Isaac Taylor, in his work on *Words and Places*, in a note p. 202, says, "that there is a Gadhelic (Erse) word *Tain* signifying water." I am inclined to consider this to be the source, as the present pronunciation agrees more with the supposed root than it does with the modern spelling.

Wotesbrokelake. The WOTESBROKELAKE of the Perambulation of 1240 is supposed by the jury of the Survey of 1609 "to be the same, which is called Whoodelake." In the composition of the word, the syllables "broke" and "lake" are synonymous, the former being the Saxon, and the latter the old British name for a rivulet. We have the word still preserved in "leat" and "leak." "Lakka" is old Cornish for a rivulet; and in Iceland and Norway, "Lœkr" is the name of a brook or small stream.

In the word Wotesbrokelake the last two syllables therefore are a reduplication, and Whoodelake is but a corruption through the transmutation of the (t) into a (d) in the first syllable, and by the dropping of the possessive (s) which exists in the more ancient word. This curious possessive addition, appended to the original name in the middle of a compound word, is several times exhibited in the moorland rivers in this old map. It is very distinctly shown in this same name, in the descriptive account of the Perambulation at the back of the map, where it is coupled with the word "fote," to signify the termination of the stream as opposed to the "hede" or head as the source. In "Wotesbrokes-lakesfote" the possessive (s) is added to every syllable but the last. Again, the Okebrook, that flows into the Dart, is called Okysbroke in the old map; it is written Okebroke in the description on the back; and in the same document, where it is used in conjunction with the word "fote," the possessive sign is transferred from the end of the first syllable to that of the word which is here taken as a whole, for the name of the river. Thus Okysbroke gets changed into Okebrokysfote. It is by dropping the possessive (s), and the reduplicate syllable "broke," that Wotesbrokelake became Wotelake, and by the changing (t) into a (d) it gradually passed into Wodelake, or Whoodelake, as it was spelt in the Survey of 1609.

This last name is, however, wanting in the maps of the present day; nor is there evidence that the name is associated

with any particular stream. Rowe, in his work on Dartmoor, says that it may be one of the tributaries of the Teign, which takes its rise near Endsworthy Hill, probably that "flowing in the hollow below towards Wallabrooke." This, however, it cannot be, as in the Perambulation (1240) it is distinctly stated that the boundary passes from Thurlstone to Heighstone, at the point where the Wotesbrokelake falls into the Tegne; and in the map this is shown to be the case also. Looking at the map of the Ordnance Survey, I can see no place for this to be so clearly distinguishable as where the stream now known as the Wallabrook falls into the Teign.

It is doubtful if the word Wallabrook can be said to be a corruption of Wotesbroke; certainly not in the usual way in which time makes changes in words. I am, however, inclined to believe, from the numerous streams on the moor which are known as Wallabrook and Ballabrook, that the word was only used originally to signify a river in which streaming for tin was being carried on, just as we now say a "tin stream," or a "mine stream." "Wal," or wel, in the former word being derived from "huel," or wheal, a tin mine; and the latter from "bal," for tin works. The banks of this stream have been extensively worked for tin; hence the substitution of the name Wallabrook for Wotesbrook, or Whoodelake; the resemblance of which, in rapid pronunciation, is not very unlike.

The modern Wallabrook is, I therefore contend, the same stream as that which anciently was mentioned in the map as "Wotesbrokelake." The Perambulation crossed the Teign, or Tenge, as it then was called, at the junction of the two streams, so as to bring them within the boundary.

From this point the Perambulation goes in a direct line to "HEGHSTONE," "Heighstone," "Heighestone," "Hangeston" of Hehestone. 1240, or "Hingeston," as it is called in the Perambulation of 1609. This mark is also figured in the old map as an upright rude stone. From all the circumstances of the case, I believe it to have been removed. From its name, I should think that it was most probably a "maenhir," which stood near the confines of Batsworthy farm, somewhat equidistant on the one side from the Teign, and from Longstone on the other, and possibly had some connection with the relics of the ancient inhabitants, the remains of which are still to be seen in the immediate neighbourhood.

From Highstone the Perambulation goes in a direct line to LANGSTONE, or Gotestone, as it is given in Risdon, which is Langstone. also figured in the old map as a rude upright stone, similar to

those of Thurlestone and Highstone, and surrounded at the base by a circle of smaller stones placed on end. There is no doubt but that the "maenhir" now known as Longstone is that alluded to in the first Perambulation, and figured in the ancient map.

Alberyshede. From Longstone the perambulation takes us to ALBERYS-HEDE, or Aberene, as it is given in Risdon, or Albereheved, as written in some old records. Heved is the Saxon root from which head is derived; hence Alberyhede and Alberyheved is the same word. In the old map it is shown to be a spot situated near a stream or rivulet. This stream is figured for a short distance, and then terminates at each end, as if the draughtsman did not know whither it flowed.

Neither in this old map, nor in either of the descriptions of the Perambulations that have come under my notice, is the river known as the South Teign mentioned. The place spoken of as "turbariam de Albereheved" is in this map called Alberyshede, that is, the head of the River Albery. In the Perambulation of 1609, the same place is spoken of as "a fenny place now called Turfehill." It was therefore a marshy place at the head of a river, and that river was most certainly the South Teign.

The South Teign is a much less important stream than the North Teign, and I think it by no means improbable that the former was at an early date known as the River Albery. There is a stream of this name that flows into the Tamar on the Cornish side, which demonstrates the possible association of it as a local name. The only difficulty is, that so many streams flow at this place into the South Teign, that it is impossible to determine which stream would lead to the head of the South Teign, particularly as two of them pass considerably beyond this point.

The turbaria of Alberyshede is, according to the Rev. S. Rowe, the same spot as that now known as "Broadmoor Mires."

From Alberyshede the stream is figured as proceeding along the boundary line, and over it is a label that carries the **Wellabroke.** name of WELLABROKE. This latter name is omitted from the Perambulation of 1609, but exists in all the descriptive records of 1240. A rivulet at this point named Wellabroke undoubtedly formed the boundary line of the forest at the time of the first Perambulation. A stream corresponding with this position flows from the direction of the King's Oven into the South Teign a little below Feaworthy, which, in the Perambulation of 1609, as well as in the ordnance maps of

the present day, is called Fernworthy, but which, according to Rowe, should be Fenworthy, and I think he is most probably correct.

Along the Wellabroke the Perambulation proceeds to the head of the stream, and then passes direct to a place that is called, both on the map and in all the descriptive records of the Perambulation, "FURNUM REGIS," and is now known by ^{Ye Furnum Regis.} its modern English translation of "King's Oven."

This place was, I believe, an ancient smelting house, known usually as a "blowing house" in the neighbourhood of Dartmoor. It consists of a circle formed by a wall of small granite stones enclosing an acre or so of land. The wall is now thrown down, and forms a confused circular mass of stones. On the southern position, connected with the wall on the inner side, is another small enclosure of a quadrangular shape, which is about 14 feet long by 10 broad, having an entrance towards the northern extremity, and a square space in the middle of the eastern wall that I take to have been the place of a furnace. The floor of this chamber-like place is paved with stones pitched on their ends. It was probably, as its name signifies, a place where the tin raised on the neighbouring lands was smelted, and is, perhaps, one of the oldest places of the kind in existence.

From this point the Perambulation proceeds to "CAPUD WALLEBROKE," the head of the Wallebrook that flows into ^{Wallebroke.} the river Dart. Along the bank of this stream it passes until it comes to the point where the East and West DARTS ^{Darts.} meet. Passing a little way up the West Dart, it comes to the foot of the stream called "OKYSBROKE," or "Okebroke," or ^{Okysbroke.} Wobroke, as it is called in the Survey of 1609, and by which name it is still known. Ascending this river it reaches another stream called DRYEWORKE, following that also until a ^{Dryeworke.} third rivulet is met with that is called DRYFELDFORD. In the ^{Dryfeldford.} old map all these streams are shown as passing within the forest bounds. Now, as all the streams that flow into the Okebroke do so on the right bank, it follows that in going up the stream of that river all its tributaries must be outside the boundary of the forest. It therefore appears, since they are all drawn as passing within the forest bounds, that the line of the Perambulation in pursuing the Okebroke must have followed the line of the Dryeworke, and thus brought the other streams within the Duchy territory. A visit to the place demonstrates this very clearly.

Dryfeldford is a point on the river probably distinguished by the moorland road, that is drawn as reaching to the river,

but not passing beyond it. In this locality there are the remains of very extensive ancient stream tin works, as the names also of the several places, such as Ledecreak, Skir Gert, and Drywork, signify. The road leads from hence to the eastern side of Brent Hill, to the north of which another road branches off, and crossing the Avon somewhere about Shipley Bridge, goes on to Glase Meet, or where the two streams known in the old map as "East Glas" and "West Glaas unite." Here also are the remains of extensive operations for tin streaming. The first road, after uniting with that from Glase Meet, passes down close to the foot of Brent Hill, where it is cut off in the plan, but evidently meets another road that comes up from Ivybridge. At Dryfelford there was most likely an ancient road across the river.

From this spot the Perambulation proceeds in a direct line ~~Catteshill~~ to a place then called "CATTESHILL" in the map, as well as in the description of the Perambulation at its back. In that of the same date, published in Rowe's work, 1848, it is written as Battyhill; while in that published by Risdon it is called Batshill, and in some of the old records "Gnatteshill." This place in the Perambulation of 1609 is said to be the same as that which was then called "Knattleburrough," which name it still retains, although it is not recorded in the map of the Ordnance Survey.

~~Westerwel-~~
~~brokischede.~~ From this point the Perambulation passes to "WESTERWEL-BROKISHEDE," that is, to the head of Western Welbroke, or, as it is probably more correctly called in Rowe's version, "Wellabroke," along the left bank of which it proceeds until it reaches that point where the river falls into the "Auena," or "Auen," or "Avon." Crossing it just where the two streams meet, the Perambulation goes on to ESTER WHITEBURG. In Rowe's edition it is spelled "Whyteburghe," but in that of Risdon it is called Easter-Wellabroke. He evidently supposed it to have been a river corresponding to Wester-Wella-broke. The relative positions of east and west being the converse, it must have been an error in the writing. Ester Whiteburgh, or Yester Whyteburghe, as it is called in the descriptive MS. on the back of the map, is a hill now known as Eastern Whiteborough in the Ordnance Survey. The line of the Perambulation, as it goes from the Avon to Easter Whyteburgh, passes by two places defined on the map by small circles. These, I presume, are intended to represent cairns or tumuli; or they may have been only solitary stones, put up to mark the pathway. This is rendered the more probable, as three other small circles are situated along

~~Ester
Whiteburg.~~

the road that is marked in the map as passing from Whyteburgh to Threberis, now called Threebarrow Tor, at which place are the remains of three large cairns. From hence the road proceeds in a direct line to East Glas, between which and West Glaas are figured the remains of some old building that most probably was connected with the ancient tin work and smelting house, of which evidence still remains.

From Esterwhiteburgh the boundary of the forest passes on to the foot of a little stream called RODELAKE, Redlake, or ^{Rodelake.} Redlake, by which last name it is now known; at this point where it runs into the Erme, the Perambulation crosses the latter river, so that the Erme and Redlake are both within the Duchy property. The Perambulation then goes on direct to a place called GRYMESGREUE. But in the copy published in ^{Grymesgreue.} Rowe's *Dartmoor*, and in that given in Risdon's *Survey*, this last word is spelled Gryms-grove and Grims-grove respectively.

In the Perambulation of 1609, the jury of the survey for the forest of Dartmoor say, that they take the place named Grims-grove in the old records to be "Arme Headd." They consequently make the boundary of the forest to ascend up the river Erme to its source, and from thence go to Plym-Head, thence to Elisboroughe.

In the old map before us we find that both the rivers ERME ^{Erme.} and the Plym are drawn distinctly to show that they pass within the forest bounds. Assuming this to be the case, of which there can be no doubt, and following the natural configuration of the ground from Redlake, where it joins the Erme in a line directed towards Eylesbarrow, we pass over a low ridge and enter a small ravine called Langcombe Bottom. On the right bank of a little stream, which has no distinguishing name separate from the valley through which it flows, is an ancient burial-place, an old "kistvaen" standing



Grimesgrave.

within a circle of nine upright stones, a spot that would attract the notice of any one who might have to pass near it on the desolate moor.

The old Saxon name of a grave is *Greaf*, the “f” being pronounced soft as “v”; thus, in pronunciation, it would sound as “greve,” and this is actually the spelling of the word in the old map, as well as in the descriptive record at its back. “Grymes-greue,” I have no doubt, is this old kistvaen on the moor, and that it is one of the points which defined the line which bounds the Duchy Forest. From Grymsgreve the Perambulation goes direct to “Elyburgh,” crossing the Plym on its way, most probably, at Plymstpes.

Elyburgh. ELYSBURGH is a Tor of no very great altitude, on which stand two large cairns, and beyond the boundary line in this locality there are figured a considerable number of small circles. These, I imagine, may mark the site of a number of hut circles, in which resided the men who turned up and searched the ground in the neighbourhood for tin, of which enough still remains to induce the adventurer to pursue the search at this present day.

Crux Sywardy. From Elyburgh the boundary line proceeds to CRUX SYWARDY, now called Nun’s-cross. In the description at the back of the map in reference to this cross is the following sentence—“Hit is to be noatid that on one syde of the cross above said their is graven in the stone Crux Siwardi, and on the other side is graven Roolande.” When I visited it a short time before I saw this passage, I closely examined the stone, and thought I could make out what appeared to be 1300. This struck me at the time as being inconsistent, as I knew the cross to be mentioned in the Perambulation of 1240. I have, therefore, no doubt but that I saw the first three letters of the word Roolande. The rest of the inscription has been destroyed by the weather.

Heghysfoder. From Siward’s Cross the Perambulation proceeds to what is now known as Little or South Hessary Tor. In Rowe’s edition of this Perambulation it is written Ysfother; in Risdon’s copy it is written Efforther; in that on the back of the map it is written so that it might be taken for Ysfother, or Yffother, inasmuch as the letter that is supposed to be “s” is nearly of the same form as the adjoining “f”; but on the map itself the letter is a very distinct upright “f.” There is another very distinct difference in the word. Thus, instead of “th,” we have the letter “d” as part of the last syllable; and, moreover, an important addition at the commencement of the word. Instead of beginning with the letter “Y,” that letter is immediately preceded by “Hegh;” thus the word upon the label on the map is HEGHYSFODER. The “Hegh,” being a prefix, means high, similar to that which we

find given to the "Heghstone" on the Teign. This probably accounts for the prefix being left out in the descriptive account on the back of the map and in the other memoirs.

In passing from "Heghysfoder," or Little Hessary Tor, as ^{Heghysfoder.} it is now called, to the next point of the Perambulation, the line crosses the upper part of the Meavy, and then goes on to another tor of the same name as the last, but which is even more obliterated as to the first two letters, leaving the others tolerably distinct. This *HEGHYSFODER* is North or Great Hessary Tor of the present maps. In the Perambulation of 1609 both this and the preceding tor are called "Hisworthie" Tors.

From this the Perambulation goes direct to the top of MYSTORRE "to a rocke called MISTORRPAN," says the Record ^{Mystorre.} of 1609; from whence it crosses the WALKHAM by a two-^{Walkham.} arched bridge, of which we have no evidence in the ordnance map, and then goes on to MEWYBURGH, which, in the ^{Mewyburgh.} Survey of 1609, is said to be the same as that called Dedlake-headd. Mewyburgh or Mewborow is not mentioned in the maps of the present day. The boundary line probably passed up the course of a small tributary of the Walkham, which takes its rise under Cockhill, and over that to Lint's Tor, which is the Lunesborowe of the Survey of 1609, and the LULLYNGYSSETE of our ancient map; but which is written ^{Lullyngyssete.} Lullingesfote in the description on the back, and Willingesesse in Risdon's copy. From Lullyngyssete, or Lynt's Tor, the Perambulation progresses along the course of a stream called Wester Redlake, until it falls into the Tavy; here it crosses it opposite to the mouth of the Rattlebrook—which is called RAKERNEBROKE in this old map—the course of which ^{Rakernebroke.} stream it follows to its source, and thus passes in a direct line to WESTSOLLE, which the Perambulation of 1609 says is ^{Westsolle.} Steinector, and Rowe marks in his map under the name of Steinga Tor. Thence the boundary proceeds to ERNESTORRE. ^{Ernestorre.} I am uncertain as to the place in the recent maps that corresponds with this, but probably Yestor is the place intended, since that is a point of land so high that it could scarcely be overlooked, and the supposed boundary line of 1609 passes between it and Higher Willhays, the loftiest tor on Dartmoor. From hence it passes on to a small chapel dedicated to St. Michael, at Halstock; thence to Cosdon, and so completing the Survey of the Perambulation.

It appears that this portion of the northern quarter was less perfectly surveyed than the other parts of the moor; for while most of the points of determination are generally not

more than a mile apart, there are but two places mentioned between the head of Rattlebrook and Cosdon, viz., Westsolle, which is supposed to be Steingator, and Ernestorre.

Beyond the circuit of the forest bounds there is, on the northern and eastern sides, no place recorded excepting the river Teign, and that is only drawn as a broad stream, at first flowing north-easterly, then turning southward. This is correct in accordance with the topographical direction of the main stream. No tributaries are represented, excepting that of the Wotesbrokelake or Whodelake, which has been already described. This is drawn as if it were a stream as important as that of the Teign itself above this junction. This feature is shown to be true by the recent Ordnance Survey—a circumstance which corroborates the suggestion that the ancient Wotesbroke is the modern Wallabrook. The South Teign is not noticed in the ancient map, and in the modern ordnance map it is only shown as but a slender stream. Near where it would take its source a small rivulet in the old map is named the Wellebroke. This flows from south to north, but is drawn as if it found its source at each extremity near a place called Alberyshede. As I have before observed, I presume this to be the marshy lands in the locality of the springs from which the South Teign takes its rise. This agrees with the position mentioned in the old map, and it appears probable that the South Teign was then known as the River Albery.

The Dart, which gives its name to the forest district, takes its own from the Celtic root *Dwr*, water. It is shown to have many branches, of which the two Darts are the largest. The other streams figured are small, but topographically some of them are important; hence they are delineated as long, and almost as broad, as those of the East and West Dart.

These tributaries flow into the Okebroke, or Wobrook, as it is now called, and this into the West Dart, which joins the East Dart just below where the Wellebrook falls into the same river. From this point the Dart flows eastward and southward.

Between the Dart and the Avon there is nothing shown on the old map until we come to the moorland path that leads from the Wobrook to join the main road from Ivybridge, which it meets just on the eastern side of Brent Hill, probably near the same point where a road at present exists following much the same route. Brent Hill is shown as a lofty eminence, with the name inscribed upon a scroll-like label. At the base of the hill stands an unnamed church, in the midst of a village represented by seven houses, each having one door,

one window, and one chimney. This is Brent village and church. The latter is constructed with a single aisle, and a square tower at the western end, surmounted by five pointed pinnacles, which I interpret to mean pinnacles at the corners with three intermedial turrets or pinnacles. The belfry has four long openings or windows in the side of the tower, and four other smaller openings situated just above the doorway, which is arched, and passes in through the southern sides of the tower. The aisle has four arched windows in the side; and from the character of the drawing, the roof was evidently covered with tiles made of burnt clay or flat pieces of wood, which are termed "shingles," specimens of which are still to be seen in the roof of the church at Morwenstow, on the north coast of Cornwall.

To the west of the village flows the river Avon, or Auena,^{Avon.} as it is written on the old map. This name is a Celtic word that signifies a river. It flows due south from its source to its mouth. A tributary on the left bank, called the Wester Welbroke, forms a section of the forest bounds. Farther down the right bank, represented as half-way between the source and the limit of the place, is a second tributary, which near its source is divided into two streams, and named in the reference, in the corner of the map, as East Glas and West Glaas; —the letter "a" being dropped in the former of the two names, because if inserted the word by its length would have interfered with the ornamental margin of the tablet on which it is written. The point where the two streams unite is now called Glazemeet, and the united stream is Glasbrook.

In the space between East and West Glaas there is delineated what appears to be a wall of masonry, that reaches from one stream to the other. At this place are still the remains of an old blowing-house, a place where tin was reduced and smelted in mediæval times. Several such places are still to be seen in various parts of the moor. Just below this old building, and apparently associated with it, is shown in the old map a quadrilateral figure, in which the south side is shorter than the other three; it is painted brown, somewhat like, but darker than, the masonry work above alluded to near it. There is no clue by which to interpret its meaning, and it is only as a guess that I suggest it might represent an enclosed spot where the dressed ore may have been collected. This place at Glazemeet must have been of some importance; for a moorland road leads to it, crossing the Avon north of what is termed in the old document "Brent in Grounde," which appears to correspond with the

present Eastern and Western Overbrent. The road probably passed near Aishridge, which may have derived its name from the circumstance. Hence, making a detour, it passed over what is now Shipley Bridge, and joined the road that came down the moor from Dryfeldford, somewhat near where Stippledon Farm now stands. Brent Moor extended from this trackway in the south to the margin of the forest bound on both sides of the river Avon.

From Glazemeet another moorland path led to Three Barrow Tor, and then to Eastern Whiteburgh, which is one of the landmarks of the forest bounds along this line. Portions of this old trackway still remain. Near the head of East Glaas is a fallen cromlech and other remains of a still older race of people.

The wall that encloses Corydon, or as the ordnance map has it, Corndown Ball, was probably built with the stone that was once a cairn beneath which this dolmen, which is of considerable pretensions, stood. The stones, the quoit of which is 12 feet long by 8 feet 6 inches broad, are fallen, but still remain on the spot. A short distance nearer to the rivulet are some upright stones placed in rows, of which I counted five distinctly; but most of the stones are short, and many of them deeply imbedded in the soil.

Three Barrow Tor is marked in this map as three white circular spots, a quarter of an inch in diameter, defined by black margins. These barrows consist of huge masses of stones, the largest cairn being 120 feet in diameter, and the smaller ones about 70. The margins are much higher than the middle, and there can be no doubt but that they have been much rummaged, chiefly for the purpose of obtaining stones for building.

One of the smaller of these cairns I opened without any satisfactory results.

Just above where the Glaasbrook falls into the Avon, the highroad, probably from Ashburton or Totnes to Plymouth, crossed the two streams on a bridge over each. They are referred to in the index of the map at V as Glaas brig, there being not room to get in the final letter (e); and W bryge, which is evidently intended for Brent Bridge, the village of which is represented as being close to it. The drawings delineating these two bridges are somewhat injured; but Glaas Bridge appears to have been constructed on a single arch, and that of the Brent Bridge bears some resemblance to Boue Bridge, which stands farther down the river. This last bridge has drawn upon its sides several vertical lines, which,

probably, are only intended to show that it was built with masonry, the more so as there are a few faint cross lines drawn also. This is represented as a single arched bridge—rising high in the centre. All the bridges on the map are represented much after this plan. It may have been a conventional way of drawing a bridge of any kind; but I am inclined to think that this high arch bridge was the then common architectural system, and probably the first improvement over the cyclopean form, several of which are still to be seen on the moor.

Between the Avon and the Erne (the next succeeding river) are several names recorded in an index painted on the map. These chiefly refer to the gates leading to the moor, called "Yeats"—a word that Risdon frequently uses for gate; and is, moreover, the common mode of pronouncing the word among the labouring people in Devonshire.

Several of the places mentioned are capable of being recognised through the changes that the names have undergone.

A. Picke Yeat. This name I cannot identify except with Peake Mill; but the immediate locality does not agree.

B. Eston Yeat, now probably Cheston or Laston.

C. Wragaton Yet, the letter (a) being crowded out from want of space in the line. This is still called Wrangaton, or, according to the ordnance map, Wrangerton.

D. Laye Yeat, now Lee.

E. Cantrel Yeat. The two first letters in this name are not quite legible; but this gate is in a central position in relation to the other nine.

F. Brodeford Yet, which I cannot determine.

G. Fyllam Yeat, now Filham.

H. Stonorde Yeat, now Stowford.

I. Harforde Yeat is still the same.

K. Owle Yeat, now Owley.

The other names mentioned on this tablet are—

L. Threberis, now Threebarrows.

M. East Glas and

N. West Glaas have still the same in name.

O. Piles Wode. This is a small wood of scrubby oaks on the banks of the Erme. In this map they are represented as trees surrounded by stakes or piles, as if put there to protect them—a circumstance suggestive of the idea that the trees were planted there and staked round for protection; hence the name Piles-wood, which it still retains.

P. Hobajons Cross. This is a very interesting monument. On the map it is drawn as a simple cross, standing upon a

pedestal consisting of two flat stones, of which the upper one is the smaller. The position of the cross is the curious part. It is situated near the centre of a long line of upright stones, such as we find in various parts of the moor connected with ancient burial places and circles.

A row of stones that appears to correspond with this line is still to be seen; but the stones are most of them weathered away to very small dimensions. The row reaches from the slope behind Butterdon, passing over a hill above Pileswood that I take to be Sharp Tor, and terminating a little beyond it. Small circular rings, which I presume are intended to represent the stones, here slightly turn to the East, and the last, that is the third beyond the summit of the hill, is larger than the rest. On this hill still remain one or two cairns.

Assuming, as it is generally believed, that these rows of stones are the relics of the earliest inhabitants that dwelt in this territory as civilized individuals, it is remarkable to find them associated with the remains of a Christian people. I can only account for it on the reasonable hypothesis, that finding the line of stones associated with superstitious reverence, the command of Pope Gregory was fulfilled, and the heathen relic was furnished with a cross, in order that the channel of worship might be changed from the false to the true symbol. The cross is gone, and the memory of it has passed away.

It is a singular fact, however, that some century and a half back, in order to rectify the bounds between Brent and Hartford moors, a jury of survey was empanelled to settle the point. This they did, and put up a cross on Three Barrow Tor for what they called a durable and everlasting monument, that should be a settlement for all time. This cross also has passed away, and I doubt if any one now living remembers it.

When I was engaged in examining into one of the cairns on Three Barrows, there was found, a short distance from the place where we were occupied, one of the arms and the top of the shaft of an old granite cross. This, no doubt, was the cross that stood on Three Barrows, which may probably have been removed from the line of stones at the back of Butterdon Hill—the old Hobajons Cross.

Q. Hanger's Shill, now called in the ordnance map Hangershell Rock. I think it is evident that here the letter "s," in connection with the aspirate in the pronunciation of the two words, has caused the sound to be prolonged. Probably the name formerly was Hanger's Hill. It is perhaps in this way that the names of the numerous places called Shil or Shell, as

Shelltop, Shilstone, have been derived. The root of this name was most probably Hengist's Hill. In a curious old book, 1685, entitled *Admirable Curiosities, &c., in England*, I find the following related in reference to a pillar called Hanging-stone :—"One of the Bound Stones which parteth Comb-martin from the next parish took the name from a Thief, who having stoln a sheep, and tyed it about his neck to carry it on his back, rested himself a while upon this Stone, which is a foot high, till the Sheep strugling slid over the Stone on the other side, and so strangled the man, which appeareth rather to be a Providence than a casualty in the execution of a Malefactor."

R. West Pignedon, now called Western Beacon.

S. Butterdone still bears the same name.

T. East Pignedon, now called Ugborrow, or Eastern Beacon. I think it is highly probable that the two hills called Eastern and Western Beacon obtained their names, not because they were places for the great fire signal ; they were too close together, and too near to Brent Beacon, to be of any real service in this way ; but, in consequence of a corruption from the original name. In the rude pronunciation of the peasant the two words would sound much the same; in this way *Pignedon* became *Beacon*.

V and W are Glaas and Brent Bridges.

X corresponds with a place now known as Blackpool. The name is illegible in the map except the terminal word *water*. It is situated immediately between Butterdon Hill and Western Beacon, not far from, though according to the ordnance map having no connection with, a stream known as the Ludbrook, that takes its rise in this locality, and flows down and joins the river Erme a little above Ermington Bridge ; but below it according to the old map—a circumstance that shows a slight deviation in the road since that time.

The River Erme appears to have been a source of trouble to Erme. the projectors of this old document. It reaches but a short distance within the precincts of the forest, and flows southward to the edge of the map. Just beyond the boundary of the Duchy forest there is an ancient place known as Erme-pound. The pound now in use is a very irregular enclosure ; but, according to the drawing in the old map, it appears formerly to have been built on a more regular design, being very nearly square. No doubt but that in early times, as in the present day, Ermepound was used for drift purpose. Driving the drift is done once a year in each quarter of the Duchy property. At these times all the cattle of the moor are driven

into the pound, and those that are not recognised or are improperly marked are sold. This custom appears to be necessary, in order to prevent persons, who have no right to send their cattle on the moor, from doing so; for we find that in 1468 the bailiffs were "amerced for not distraining Thomas Thurusdon to answer for keeping eight beasts on the forest and common of Devon for seven years without license, &c." Erme, or Arme-pound as it is called in the map, corresponds well with its correct position on the moor. But on descending the river, we come to a hill called "Staldon Moore;" this is placed upon the left bank of the stream between it and Three Barrow Tor, or "Threberis," as it was then called.

Staldon Moor is not in this place at all, but on the high ground on the other side of the river, and stands in the position shown in the map in relation to the Yealm instead of the Erme. That this was the mistake most probably made by the authors of the map is capable of demonstration; first, because the spot chosen for the hill called Staldon Moor is really a very deep combe or valley; and secondly, a little farther down the stream, that is, below Harford Bridge, the river is called Yealm Water.

Near Cornwood on the map is a very large label, the name on which is much obliterated except the terminal word "More." I think it is Staldon More, with which it corresponds in position. The letters A and D in the name are capable of being made out, and Staldon or "Staldon More" in the old map being shown evidently on the wrong side of the river, I think that this label may have been intended as a correction of the previous error. The label differs from most of the others on which names of places have been written. It consists of a mass of white body colour painted over the green. This is the same with the names of Brent Hill and Armenton Bridge, and the roads over Brent Moor. These have the appearance of having been added after the map was finished.

Added to all this the stream that flows where the Yealm should be shown is not drawn; but faint traces of lines which appear to have been those of the river are distinctly visible, although they have been painted over. Many such lines are seen about the map, as if the designing of it had been a source of very great care and trouble. The root of the name of the Yealm is veiled in as great obscurity as that of the Erme, for which I think no reasonable suggestion has been offered. In a map in Camden's *Britannia* the former river is called Alme River where it is inland; and at

its entrance it is written as Ye Alme Mouth—a circumstance which is suggestive of the great probability that the word is formed by the permanent retention of the Saxon *prefixed article* to the word Alme. Thus we get the name of the Yealm. In an old document "the Erme" is written "Yerme."

Harford Church stands near Harford Bridge, which appears to divide the Erme River from that called Yealm Water.

Harford Church is nearly obliterated. It was a small building, with a square tower, surmounted by five turrets. I think that this means three turrets on each side between the pinnacles at the corners. From Harford Bridge a path went over the moor, probably taking nearly the same route as that of an old roadway which at present leads by Wisdom to

Cornwood.

I am induced to think that this route rather than the more direct and modern one is correct, because the road is shown to have made a slight detour to the north, and again curves so as to approach the church from the south. This church was built in the form of a cross, with a short steeple on the top of a plain tower.

From Cornwood the road goes northward to the Plym, or, Plym as it was then most probably called, the "Mewy," to an unnamed bridge, which I take to be Shaugh.

On the right hand, that is, north of the road and between it and the left bank of the Plym, there is in this old map evidence that a church with a small steeple once stood. This corresponds in position with that of Shaugh Church. It is, Shaugh. as far as visible, drawn with a large hill behind it, but the name on the label is only partially intelligible; but what can be made out may be part of the word "prior," the terminal portion of "Shaugh Prior."

The River Plym in this old map is shown as being a small tributary falling into the river called "Mewy Water."

The term water appears generally to be applied to that part of the river which may be called the main stream, as the Tavy Water, Mewy Water, Yealm Water.

The Mewy, or Meavy, as it is now called, is still a more Mewy. important stream than the Plym, both as to length and volume of water. This is shown to be correct according to the evidence of the Ordnance Survey.

The Plym commences within the forest bounds, and after it has passed beyond the limits of the Duchy property, it is (on the map) covered by a small circular label, on which is

written the following partially illegible legend, the meaning of which has puzzled the ingenuity of several of my friends as well as myself.*

Just below where the Plym empties itself into the Mewey Water a bridge crossed the river. The distance between the junction of the two rivers and the bridge, in the map, is suggestive of its being a little farther down the stream than where Shaugh Bridge now is, and not so far as Bickleigh Bridge. The road that passes over the bridge goes directly to Meavy, then called Mewy Church. This church was a small edifice, with a single aisle, having a tall window at the end, and two at the side; a high tower, with a lofty doorway, and surmounted by four turrets. From Mewy Church a road winds down to "Bicley Church," a circumstance suggesting that the modern Meavy Church cannot be on the same site as the ancient Mewy, since Shaugh Bridge is nearer to Bickleigh than to Meavy. Bicley is shown to be a low church with a single broad aisle, having three small windows at the side, and a door at the western end; the tower is low, without turrets, and surmounted by a small steeple.

Between the Plym and the Mew is the little church of Sheepstor. "Shetstor,"† now called Sheepstor, just above which is a tributary that takes its rise near "Crux Sywardy." This stream, therefore, must be that which in the ordnance survey flows by Milcombe, and joins the Mew at Nosworthy. Somewhat above this spot, on the right bank of the Mew or Meavy, is shown a small church, built in the cruciform style, having three narrow windows in the eastern aisle, and two in the western. The porch entrance was large and spacious, and the tower surmounted by four turrets; in the tower or belfry were three

* A friend writes in reference to this name: "It looks as though it might be read 'Craitsidels,' or perhaps 'Croundel.' If the former, may it be derived from Anglo-Saxon 'Creahgt,' cattle, and our English word 'Sidle,' to set aside, or out of the way? Hence, simply cattle pounds." The position being to embrace the stream appears to be an unlikely one for a cattle pound; but if the latter, is it possibly Plym Croundale?" There is a Croundale marked in the ordnance map on the Tavy, about one mile below Tavistock."

† A fact that is destructive to the assumption that the tor derived its name from "Sheep." All such names as Fox Tor, Hare Tor, Vixen Tor, Linx Tor, Sheeps Tor, are nothing more than corruptions from older names, to the pronunciation of which a modern meaning has been given.

narrow windows. This church does not correspond with that of any now existing.*

Not far below it, imperfectly seen, is a drawing of "Bock-^{Buckland.}land Church," and still lower down, and filling the space between the Meavy and the Tavy, is what I take to be the old Abbey of Buckland Monachorum. The edifice stands within an enclosure, and on what I should presume was intended to represent raised ground, to which there are two entrances. The abbey is of a cruciform construction, having a large square central tower. It has four windows, long and narrow, on the eastern aisle or chancel, and two at the side of the western aisle, the end of which is occupied with a large mullioned window. The tower is represented as if it had been erected diagonally instead of square with the rest of the abbey. It is turreted, and has each side furnished with two or three windows. The entrance is lofty and spacious, and opens at the end of the southern transept. The abbey is shown as having been surrounded by trees, that were nearly as lofty as the tower. In the middle of the stream immediately below the abbey is written a word that I cannot clearly decipher. It is closely represented in the following woodcut,

No letters of the same character are shown on the face of the map; but the description of the Perambulation on the back is in the same style of writing. The name appears to read "Lobba Pilla." Some traces of the obliterated letter in the centre appears to represent the form of the capital letter P, as it is written on the back of the map.

The position in the river corresponds with the head of the salt-water creek that runs up by Maristowe. The name Pill means a small harbour or creek. It is, therefore, not improbable that "Lobba Pilla" may have been the ancient name of the estuary at the mouth of the river Tavy.

In confirmation of this hypothesis, I find that a place at the head of the creek still bears the name of "Lophill." The corruption of the ancient name into the present form is one of easy descent. In Devonshire it is very common, for the sake of euphony, to find a terminal vowel added to a name,

* No church is shown where Sampford Spiney stands, and as this unknown one is in the position relative to the Meavy that Sampford Spiney should be to the Walkham, I think that an error may have occurred in the mapping, somewhat like that which placed Staldon Moor on the left bank of the Erme.

the suppression of which in "Lobba Pilla" readily makes the word "Lobb pill," which in pronunciation closely resembles that of Lophill, the name recorded on our present Ordnance Map.

Further up the river is called "Tavy Water," and on the left bank is the Walkham, a river of considerable importance, which rises within the forest bounds. On the left bank of this river is Walkhampton Church, which appears, as well as we can see from the remains of the drawing, to have been built in the usual cruciform style of architecture with low turreted tower. The road from the church passed over the Walkham, most probably where Huckworthy Bridge now stands. In the fork between the Rivers Walkham and the Tavy there appears to have been drawn a small church, which, if correct, can only be intended to represent Whitchurch. From this point a road leads to a bridge that crosses the Tavy just below

Peter Tavy. Peter Tavy, from whence it goes up the left bank of the river to the church. The road that passes over the bridge goes on to Lidford Church, which is shown to have been built with three parallel aisles, having a moderately-sized window in each gable end. The tower is crowned by a short steeple, and **Lidford.** two long windows in the side. Lidford appears to have been drawn by the projector of the map in this position, because **Mari Tavy.** there was no room to put it farther off. Thus Mari Tavy is drawn as being farther up the river, whereas Lidford is beyond the Lyd some four miles to the north.

Tavy. The River Tavy rises far within the forest near the head of the Dart, and its tributary Rakernbroke, now Rattlebrook, forms for some mile or two the boundary to the forest. Farther down the stream, below Peter Tavy Bridge some way, is shown **Tavystok.** the Old Church of Tavystok. It appears to have consisted of two aisles, one with a door at the end and the other with a window. In the side are five arched windows. Behind the church appears a cloister, and within it one or more dwellings; two of these appear with a chimney on the top, and the third has a small steeple, underneath which is a broad arched doorway. From Tavistock there is a road that leads over the River Tavy apparently on a single arched bridge, probably near where the present one now is. From this the road goes towards the forest, crossing the Walkham at Merrivale Bridge, entering the bounds south of Mistor, passing between it and Hessary Tor, or, as it is written on the map, Heghysfoder. Hence the road goes eastward. This would have been correct if the forest had been a true circle according to the conventional plan, instead of an oval which is its real shape. Consequently the road goes north-east across the moor, leaving the

Walkham and the Tavy to the left and the Dart to the right, as also the Teign and the Wotesbroke, and leaving the Duchy ground between Thurlstone on the right, and Honderet, or Parva Hoga de Hounde Tor, on the left, and so passing on beyond the limits of the map.

It would be interesting to know to what place this road went. It is the only one delineated as crossing the forest, which at that time must have been very wild and desolate. If we knew the road existed in very primitive times as an oft-beaten trackway, we might associate it with the several sacred circles that correspond with its direction. It is, moreover, in a direct line between the aboriginal remains near Merrivale Bridge and those of the north, including the cromlech and associated relics of antiquity at Moretonhampstead. Although the road may have followed nearly the same route as that of a preceding trackway, the evidence is clear that it had no connection in mediæval times with any pre-historic monuments, inasmuch as the road led from Tavistock to some place beyond the forest bounds on the north, and beyond the limits of the map. It did not go to Chagford, since the route lay north of the Teign; but it may have gone to Throwleigh.

In the map the roads that lead from town to town are painted red and yellow; the more important, as the main road from Brent to Plymouth, has a double red line with an intermediate one of yellow; so also the one leading from Ivybridge down by the side of the Erme, probably to Modbury. The others, passing from church to church, have but a single line of red, and that not so conspicuous as the line of yellow which is painted by its side. But the roads that traverse the Brent Moors, leading to no town, are painted with two black lines and an intermediate white one. These roads, I presume, represent the pathways over the moor by which the miners brought the tin they found to market. Each of these roads leads to a place that has been well worked over for tin. Skir Gert, called Skir Gut in the maps, is a very extensive ancient tin works, as its name implies, "Gert" being the name by which "old men's workings" are known in the locality. This is on the stream marked in the map as Dryfeldford, which name means the same, the road over the Hilly or Rocky Workings. Terhi, Workings; Feld, Hill; Ford, Road.

Also of the same colour are painted the roads leading to Glazemeet and to Ester Whiteburgh. The road that crosses the forest is very nearly obliterated; but what is left of it is black, with a slight trace of red; showing clearly, I think, that

the road was a miners' trackway, and not a church path. That the dark line in the road had an interpretation distinguishing the roads so marked from the others, receives further confirmation in the fact that Tavistock and Lydford were closely associated with the Duchy property, the one being a Stannary town, and the other an ancient Court of Judicature. The roads to both these places have a dark line, as well as a yellow and red one. The road, on entering within the forest lines, passes over the Walkham at Merrivale Bridge.

Merrivale. Merrivale Bridge is a modern, pleasantly sounding name. Near it are many interesting relics of the past history of the early inhabitants of Dartmoor. The place is known also as the "Plague Market." Why by this latter appellation, there is no apparent reason. The Rev. E. A. Bray suggested the idea that the market may have been removed to Merrivale Bridge from Tavistock when the plague was there, that the inhabitants of Devon might not be infected by the disorder.

The idea is ingenious, but wants the support of evidence. There is nothing to show that the plague as an epidemic ever visited Tavistock. Besides, the very conditions are strongly against the probability of the market having been on Dartmoor. If the people of Tavistock wished to be supplied with food, they would not be likely to expect it on the side of a barren and uncultivated district, the people of which even now have to draw all their provisions from the cultivated valleys beyond its limit. Thus Merrivale, four miles and a half from Tavistock, could never have been, even temporarily, a food market.

Wistman's Wood. Whenever any old known place has a modern name attached to it, it is always the result of a corruption from an ancient word, the meaning of which is lost in the locality, to that of one which is intelligible. For instance, Wistman's Wood is always stated to mean Wise Man's Wood, and thus supposed to be the grove of Druids. Whereas I think there can be little doubt but that the name is a corruption from *wysg*, water; *maen*, rock; *coed*, wood. "*Wysg-maen-coed*" would sound very like, and easily be corrupted into Wistman's Wood. Thus Wistman's Wood only means the "Rocky Wood by the river." So, I believe, it is with Merrivale Bridge.

Max Muller has shown us clearly that "mara" in "Marazion" is derived from "maras" or "margaz," an old Celtic Cornish word signifying market. In the same language, the old Cornish word "Bal" means "tin mines." Thus, "maras bal" would mean the "tin market," or place where in early times the miners disposed of their tin ores. 'B' in sound is easily transmut-

able into 'v'; hence we have "marasval." In the old Cornish language "val" means "plague;" thus we see that the translation of "marasval," instead of being the "tin market," became "plague market." Hence I explain the two names of this locality; one being the corruption of the old name of tin market from "marasbal" to "maraval," thence "Merrivale;" and the second a translation of the corrupted "maraval," namely, "plague market," just as "y^e Furnum Regis" has become "King's Oven."

I therefore contend that, read by the interpretation of the name, the place was in the early days of its history a tin market, and that the road across the moor was a track by which dealers in tin passed to and from Merrivale Bridge and Tavistock, to a place ready to receive their produce on the other side of the moor. It is a curious circumstance that just beyond Throwleigh, in a line corresponding with the direction in which the road leads, is a place called Merrymeet. It is not improbable that the old road led from one market place to another.

Merripit Hill is another place similarly named associated ~~Merripit~~. with extensive tin works, it is near the source of the Webber, and the great works around Vitifer Mine in the neighbourhood of "y^e Furnum Regis."

The mining operations of later dates may be distinguished from the more ancient by the character of the works. In some instances the modern explorations have been carried on upon the site of the "old men's workings." This may be seen at Stanlake; in which name we find the Roman word "stannum" and the Celtic "lakka" united to tell us that the place was a "tin stream." While the stone rows, with their circles and cairns, tell of an older occupation in the period of human civilisation; and the remains of a mill leat, two smelting or blowing-houses, demonstrate that the place has been worked within the period of the moorland records.

I cannot conclude this memoir without expressing my thanks to Mr. J. Atkyns, of Lowick, for his kindness in drawing my attention to the map, and for his assistance in tracing it with me; to Mr. Winslow Jones, for leaving it, with the owner's (Mr. T. Lane) permission, so long in my hands, without which the copy could not have been so perfect as it is; also to Mr. Jas. Hine, F.R.I.B.A., for so carefully reducing the map for me. The difficulty of interpreting the entire plan, and making out the several details, may be best appreciated when I say that I had the map for months in my possession before I made out the road across the forest, and I

have seen the bridge over the Walkham above Merrivale Bridge only since the draught has been in the engraver's hands.

The recovery of this interesting old map may probably throw much light on the early history of Dartmoor. The *Jugum Ocrinum* of the ancients must, from its old tin-bearing qualities, ever retain a close association with the early history of the civilisation of Western Europe. For it cannot be disputed but that the bronze of pre-historic man could not have been made until after the discovery of Dartmoor, or rather the tin-bearing streams of Devon and Cornwall, of which those of Dartmoor surpass all the rest in extent.

It is to be hoped the publication of this map may bring to light other old plans or documents relating to Dartmoor that may be still preserved.

RESEARCHES INTO SOME ANTIENT TUMULI ON DARTMOOR.

BY C. SPENCE BATE, F.R.S., ETC.

(Read at Exeter, July, 1872.)

SCATTERED over the surface of Dartmoor are numerous tumuli. These differ in some places ; but the most common form is that of a cairn, of small irregular stones.

They vary in size from a few feet to a hundred and fifty or more in diameter, and from four or five to twenty feet in height. The stones with which they were erected are mostly small, such as a man could easily carry. Similar stones are scarce on the moor, so much so that, to obtain a cartload of them for building, persons often come from a long distance.

This circumstance suggests the idea that these cairns were not each completed in a short time from their commencement. They probably grew with years ; and an honoured chieftain would be likely to have raised over him a noble cairn, while the tomb of a hated enemy, who fell among a strange tribe, might long remain uncovered.

PENBEACON.

On the southern slope of Penbeacon is an old hedge or trackway, which extends from an enclosed village or pound, that contains ten or a dozen hut circles, westward for about a mile, reaching nearly to Trowlsworthy Tor. Here it appears to terminate at an ancient cairn of stones, so overgrown with lichens and moss that the pedestrian might easily pass beyond it without detecting its character.

Towards the eastern end, about one hundred and ninety feet north of this same trackway, is another enclosed village or pound, surrounded by a strong wall, having an opening towards the south. This contains five or six hut circles.

About eight hundred feet south of this trackway stands a cairn which is about one hundred and fifty paces round. It is

fifty feet in the longer axis, which lies north and south, and forty-two or three from east to west. It was not possible to take a very exact measurement, as the crown of the cairn had evidently been broken into, and the stones that were removed were thrown down the sides, so as to give the base of the cairn an irregular circumference.

At a few feet from the base were several single stones that, from their position, might readily have been mistaken for a circle of upright stones surrounding the cairn. Although these were apparently embedded in the soil, they were small and evidently not intentionally fixed in the ground.

On the southern side of the cairn, about four feet from the base, in a line that runs S.S.W., stand four upright stones in pairs. Fig. 1.

The two nearest the cairn are two feet apart, two feet long, and eighteen inches above the ground. The second pair is ten feet south of the first, and four feet apart. One is erect, being eighteen inches above the ground, and rather more than a foot in length; the other has fallen, and therefore shows the height of the stone in the measurement of its length. It is three feet long.

On the 30th of March in this year, in company with

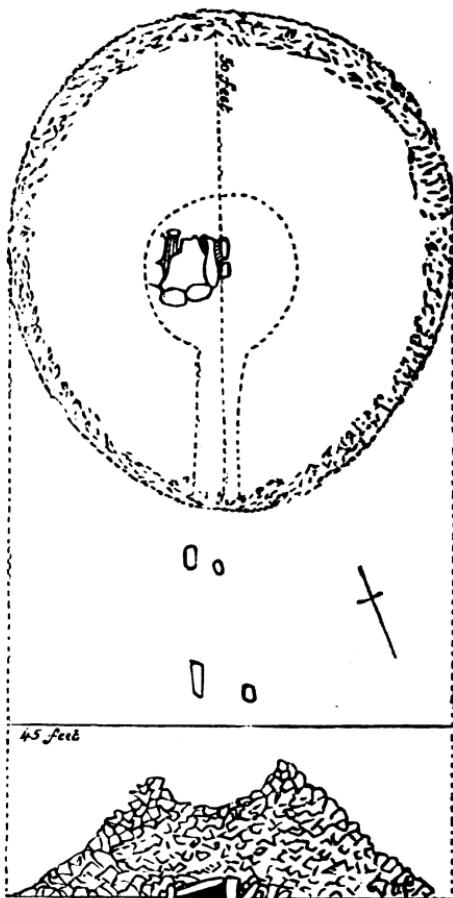


Fig. 1.

Captain Oliver, R.A., I opened a trench into this cairn in a line corresponding with the direction of the two rows of stones. From the circumstance that the centre of the cairn had been previously partially excavated, the labourers gradually lost the direct line, and worked their way into the middle of the cairn. This we opened tolerably extensively, clearing away all the stones until we came to the surface of the soil on which the cairn rested.

Seeing that the line of stones had not been sufficiently followed, we determined to explore farther to the west, so as to open up a line direct from the avenue or double row of stones beyond the cairn.

In pursuit of this plan, we came upon several stones very much larger than any we had met with before, one being about four feet long by two broad. This was placed on its side, and appeared to have been retained originally in its position by the support it received from two other rather large stones, which were obliquely jammed under its base.

On the western side of these stones were three or four others not quite so large. These were in such position relative to each other, that it was evident they were the sides of a not very perfect kist. The upper or cap stone had fallen in on one side.

Beneath this stone was a hollow space, and in the peat below we found an implement of an oval shape. It was about three inches and a half long by one wide. It is very thin, and has both ends bevelled off on opposite sides. One end is much more so than the other. On the surface of the stone are many fine scratches. It is made out of a yellowish-white soft slate stone. It appears as if it would very readily break into thin lamina. Fig. 2.

I know of no kind of stone in this locality that resembles it. A figure of a piece of slate differing a little in section is given in Mr. Evans's recent work on *The Stone Age of Britain*, and another in



Fig. 2.

Mr. Stephens's *Flint Chips*. Both these authors assert their inability to interpret the uses of the implements they have described.

It appears to me there can be little doubt but that the slate implement found on Dartmoor was used for the purpose of fashioning clay vessels while yet unbaked.

The shape of the tool, the wearing at both extremities on opposite sides, demonstrate clearly its aptitude for the purpose. I have, moreover, been informed that in some parts of Ireland similar pieces of slate are still so used.

We removed all the larger stones and the soil beneath them. Finding that the peat gradually dipped away westward beneath the cairn, we extended our research, but excavation in every direction led only to the conviction that some attempt had been made at a previous examination of the cairn.

The urn, if, as we suppose, there had been one, was destroyed. The evidence of this existed in the numerous fragments that were found in different parts of the cairn, all of which evidently belonged to one and the same vessel. Fig. 3.

One fragment was sufficiently large to enable us to state that the diameter of the mouth of the urn was about eight inches, and that it had a constricted neck about an inch and a half from the edge of the vase. The rim or edge of the vessel was the thickest part of it. At this place it was nearly half an inch thick, from whence it rapidly but gradually thinned away to little more than the eighth of an inch. The material of which it was formed was a coarse clay, in which were still to be seen fragments of quartz. It had the appearance of and in all probability was made from clay found in the



Fig. 3.

locality, of which there is a substratum beneath the peat in most places on the moor. The colour of the unused clay is of an ochreish red. The pot itself is stained dark with age, but it has a reddish hue that resembles the colour of the moorland clay. It might perhaps be due to the heat in the baking of the vessel. It evidently had been fire baked, and is very much harder than these vessels usually are.

About 270 yards east of this cairn was another about forty feet in diameter, from which almost all the stones have been removed, probably for the erection of a wall some few hundred yards southward down the side of the hill. In doing this

the central kist has been destroyed. I much regretted this circumstance, for the cairn must have been an important one, since it was surrounded by a circle of upright stones from one to three feet in height. The larger appear to have been on the southern side, on which also a little to the westward is placed, as in the former cairn, a row of two pairs of stones.

THREEBARROW TOR.

Three large cairns marked in the old map of the Forest Perambulation of 1240, and therein called Threeberis, stand upon an eminence 1524 feet above the sea, which is now known as Threebarrow Tor. The largest is one hundred and twenty feet in diameter, and the other two about seventy. They are neither of them more than ten feet high, and that chiefly at the circumference. Towards the centre they are not more than half that height, and have much the appearance of having been ransacked; not, however, in a systematic manner.

There is much in their general appearance to suggest that the cairns may have gradually grown, and so have never been completed. It might be supposed that in early times, when men were mostly their own beasts of burden, that in forming large heaps of stones there would be a tendency to increase by spreading out at the circumference, rather than in height. In this way I think these cairns may have spread out and increased at the edges rather than have been pulled down by explorers. No doubt but that cart-loads of these stones have frequently been removed for building purposes.

The importance and size of these conspicuous cairns induced me to explore the most westerly of them. This was done in company with Capt. Oliver, with the assistance of several men belonging to his brigade of the Royal Artillery. We pursued our researches for three days, removing at least half the cairn, and excavated into the soil below, but without being rewarded for our labour; and I only wish to put these facts on record. Some large stones we found near the centre, but without any apparent design or regularity; and two upright ones were implanted in the ground near the margin on the southern side of the cairn. These appear to stand in a similar position in relation to the cairn to those before noticed under Penbeacon.

HAMMELDON DOWN.

On Hammeldon Down are tumuli of different kinds of construction. On Hooknor Tor, immediately north of Grims-

pound, is a cairn of stones similar to those that we have previously described. On King's Tor, about half a mile to the eastward, is another tumulus, known as "King's Barrow," consisting throughout of stones and earth. This has been imperfectly explored without result by our late lamented friend the Rev. R. Kirwan. About a mile to the south-west is a very extensive tumulus, called "Broadbarrow." This consists of earth or earth and stone; it is higher at the margin than within.

South of this last is another, known as "Single Barrow;" it is not more than four feet in height, but extends to a circumference probably of nearly two hundred feet. Farther to the south are two tumuli near each other, and known by the name of "Two Barrows." On the southernmost of these stands a boundary wall. The other was untouched; it was about four feet and a half high, and forty feet in diameter. This I determined to explore.

An interest to my mind is associated with these barrows. Many of the names in this locality bear a Scandinavian interpretation.

Hameldon, or the Hill of Hamel, shows us that the old Viking of that name must have made this place his centre of operations for some time, and the old Hero Grim has given his name to the pound under Hooknor Tor.

Grimsound itself is a formidable, defensive enclosure. Its walls were ten feet thick, and built with massive blocks of granite in double rows. It contains many hut circles. The stream that flows through it is known as Grimslake, and the tor above it as Grimstor, whereas Hooknor Tor finds its root in Hoga or Hock, signifying a hill associated with deeds of importance, and King's Barrow, but a short distance off, tells of royal interment.

Grim and Hamel are the names of two important chiefs among the predatory leaders that crept up the rivers of most northern countries in the days of early civilization.

The barrow was opened on the southern side, taking a space of about fifteen feet in width. The men first passed through a layer of stones moderate in size and irregular in shape. These formed a circle round the barrow. A few stones of similar character were scattered over its surface. Plate 1.

Having cut through this low bank of irregular stones, we found the barrow to consist of peaty earth, black and clayey in character; but this latter quality was perhaps due much to the recent rains. Having excavated our way for about fifteen feet, one of the men struck a stone, and in cutting away the

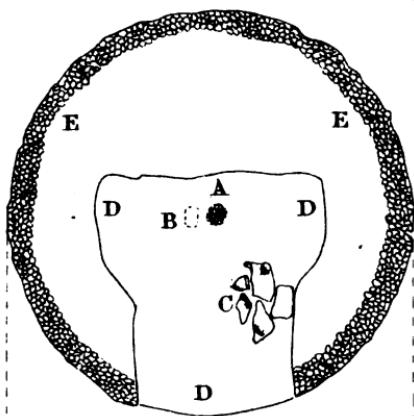


Fig. 1.

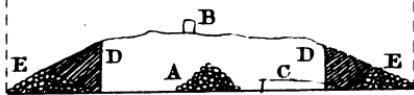
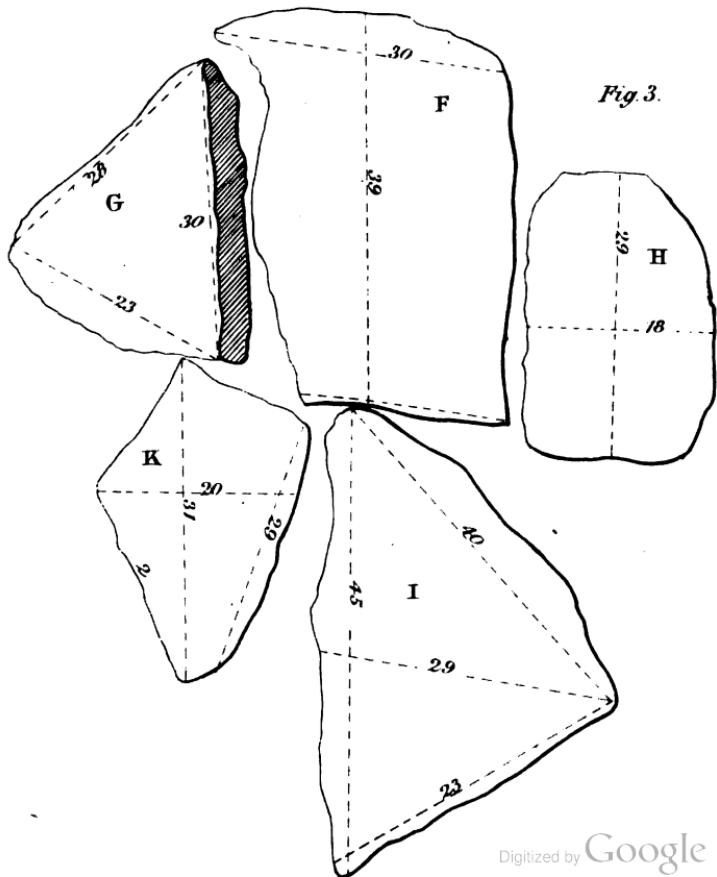


Fig. 2.



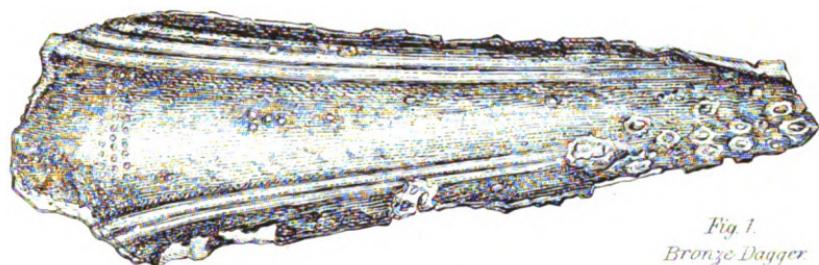


Fig. 1.
Bronze Dagger



Fig. 2.
Amber Pommel of Hilt.
Top View



Fig. 3.
Side View

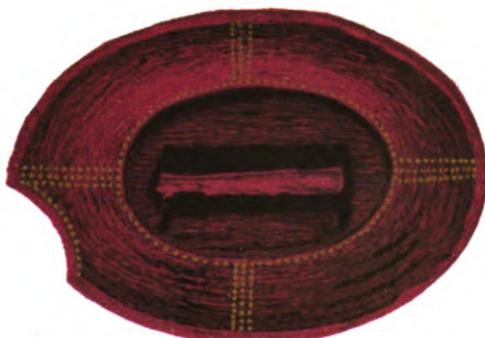


Fig. 4.
Bottom View.

soil for the purpose of exposing it, a large hole or hollow space was observed above it. Proceeding with the removal of the earth, we came upon a second stone, and others, until five were discovered, lying flat on the ground. The earth was then removed all round them, to see if any others were there. After sketching and measuring the stones in position, they were carefully removed, and, to our great disappointment, nothing appeared but the same kind of earth as that which existed above them. Close observation, and a little scratching of the surface under the stone marked K in the plan, brought to view a mass of comminuted bones mixed with earth. These were carefully removed to a cart, for the purpose of a closer examination at home, when a shovel disturbed an ornament of beautiful workmanship.

It consists of amber, much darkened by being so long buried in the peat. The surface is inlaid with gold pins,* placed in a line formed of three parallel rows. One line is longitudinal with the longer axis of the oval, the other with the shorter, the two forming a cross on the surface. Plate 2. Each of these two lines are continuous over the back, and a similar line traverses the circumference along the edge. A row of single pins is situated near the margin of the posterior surface on the innermost edge.

The back is bevelled with a concave curve to the distance of half an inch, where it terminates in a flat surface, oval in shape, and corresponding in form, but much smaller than the front surface. The middle of the oval at the back is longitudinally deeply cut on each side, so as to leave a projecting tongue between the two morticed groves. Through this tongue two holes are pierced, which clearly demonstrate that it was secured by being tied to some other object.

One point of interest exists in the fact that a small portion had been broken off previous to its interment, and again mended by a very neat process, that of uniting the fractured fragments to the main piece by means of a series of gold rivets, thus converting the damage into an additional ornamentation.

This ornament tells us of a high degree of advancement made in the arts at this period, and also of the intercourse of the people of Dartmoor with those of distant nations.

* Mr. J. B. Rowe has obligingly sent to me an extract from Fairholt's "Costume in England" (second edition, 1860, p. 7), in which is described the wooden handle of a dagger excavated from a grave in Wiltshire, which was ornamented in zig-zag pattern by similar gold pins. So very minute were these pins that thousands were thrown away, and only detected amidst the soil by the aid of a magnifying glass.

Amber at this present time is found in various localities ; but in the days of the early civilization of Europe it was only known as the produce of the coasts of the Baltic, whence the Romans, according to Tacitus, obtained it, chiefly from the *Æstvi*.

This ornament, moreover, tells us that they could not only work in amber, but that they had the power of working in metals, of drawing gold into fine wire, and inserting it into the amber, which was probably done by softening the latter, and then pressing in the gold pins previously to their being cut off and polished.

In the earth that we carted home, besides a quantity of bits of bone, we found the blade of a bronze dagger. It is evidently of a long and narrow form, ornamented on each side by a series of three depressed lines corresponding with the margin of the weapon, and by a series of dots or small pits in these rows across the base. No trace of the handle was found, and no evidence of fire, excepting in the signs of its action on the bones.

The next operation was to enlarge the trench to twenty-five feet in width. This we pursued until we had passed the centre by several feet, without any further results, excepting that in the very centre of the tumulus we found a small cairn of stones that appeared to have been carefully heaped up. All these stones were removed by hand, and every one examined ; but nothing was found except one minute fragment of charcoal.

The points of interest in this cairn are, first, the character of the interment ; secondly, the objects found entombed.

According to my experience of the Dartmoor tumuli, most of them consist of heaps of stones, containing a stone kist or small chamber, within which has frequently been found an earthen vase of baked clay, containing the calcined bones of the individual to whose honour the tumulus was erected. These have frequently been associated with some weapon of bronze, and sometimes of stone.

In this instance the mound was of earth, with a course of small uneven stones heaped one on the other round the margin. The stones (pl. 1, fig. C) instead of forming a kist, all lay flat on the ground. Over them, certainly, was a hollow space that is suggestive of the stones having fallen lower. The position, however, in which they were found in relation to each other is such as to show that they never could have been placed so as to have formed a chamber or kist.

Again, instead of the cremated bones being enclosed within

a vase, they were found lying closely placed together in one spot beneath the stones, and on the surface of the ground. Most of these bones were unintelligible fragments. One specimen, about an inch and a half long and one and a quarter broad, was a portion of the frontal bone, including the upper margin of the left eye. The specimen, though small, was sufficient to show that the superciliary ridge was thick and the frontal arch full.

This kind of interment, I have been informed, has recently been observed in the exploration of some Swedish barrows.

In the soil, about a foot or eighteen inches from the little heap of bones, beneath the stone marked K in plate fig. 3, there was also found the bronze blade of a dagger. One side of this is tolerably perfect. The other is much corroded, so also is the extreme point, as well as base. No trace of the handle could be found, which induces us to believe that it was either made of wood, bone, or horn.

It is the opinion of Sir John Lubbock that the amber ornament previously described is the pommel or terminal ornament that was attached to the extremity of the dagger's hilt. Mr. Franks, F.S.A., writes:—"I should conjecture that it is very ancient—quite as old as the bronze period. It may be the pommel of a sword hilt, but I never saw anything like it." While Mr. Evans, F.S.A., thinks it rather too large to belong to this same bronze blade; but thinks it may be the pommel of a sword, or other weapon of larger description.

The little cairn of small stones in the middle of the barrow has yet to be explained. No ashes or any evidence of fire, except one small fragment of charcoal, was found. It is, therefore, difficult to believe it to be the centre of the funeral pyre.

The whole interment is very unlike those found elsewhere on Dartmoor, and the contents strongly evidence an intercourse with a foreign people. Associated as the locality around it is with names of a Scandinavian type, I think that the evidence tends to the direction, that the barrow was erected by some old Viking, who, in the early bronze age, crept up the Dart in search of tin.

I cannot conclude an account of the exploration in the Dartmoor tumuli during this summer, without expressing my thanks to those gentlemen who have accorded to me permission to open the barrows upon their estate.



LIST OF MEMBERS.

• Indicates Life Members.

+ Indicates Honorary Members.

‡ Indicates Corresponding Members.

Notice of changes of Residence should be sent to the Honorary Secretary,
Rev. W. Harpley, Clayhanger Rectory, Tiverton.

Year of
Election.

- 1871 Ackland, W. H., M.D., Bideford.
1872 †Adams, John Couch, M.A., D.C.L., F.R.S., F.R.A.S., Director of Observatory and Lowndean Professor of Astronomy and Geometry in the University of Cambridge, The Observatory, Cambridge.
1872 Alloway, R. M. M., M.A., The Holne, Torquay.
1869 Amery, J. S., Druid, Ashburton.
1869 Amery, P. F. S., Druid, Ashburton.
1872 Amery, Sparke, Druid, Ashburton.
1863 Appleton, Edward, F.I.B.A., Cotswold, Torquay.
1870 Arnold, G., Dolton.
1868 Ash, F., Dartmouth.
1868 Ashley, J., Honiton.

1871 Bangham, Joseph, Torrington.
1862 Barnes, Rev. Preb., M.A., The Vicarage, Heavitree, Exeter.
1862 Bate, C. Spence, F.R.S., &c., 8, Mulgrave Place, Plymouth.
1872 Bate, James J. R., Bampton Street, Tiverton.
1872 Battishill, W. H., The Close, Exeter.
1866 Bayly, John, 3, Brunswick Terrace, Plymouth.
1866* Bayly, Richard, 3, Brunswick Terrace, Plymouth.
1871* Bayly, Robert, 3, Bedford Terrace, Plymouth.
1868 Bayley, W. R., M.A., Cotford House, Sidbury, Sidmouth.
1871 Bazeley, Rev. F. L., Rectory, Bideford.
1862 Berry, Richard L., Chagford.
1868 Bidder, George P., C.E., Ravensbury, Dartmouth.
1870 Binns, Rev. W., 38, Portland Place, Morice Town, Devonport.
1865 Blackmore, Humphrey, Garston, Torquay.
1872 Borlase, W. C., F.G.S., Castle Horneck, Penzance.
1862 Bowring, Sir John, LL.D., F.R.S., &c., Claremont House, Exeter.
1872 Bowring, E. A., M.P., 69, Westbourne Terrace, Hyde Park, London. W.

- 1869 Brendon, William, George Street, Plymouth.
 1870 Briggs, T. R. A., 4, Portland Villas, Plymouth.
 1872 Broderick, W., Littlehill, Chudleigh.
 1872 Brokensha, Capt. S., R.N., 3, The Heywoods, Teignmouth.
 1872 Buckingham, W., 12, Southernhay, Exeter.
 1868 Buller, W. W., Becky Fall, Manaton, Moretonhampstead.
 1871 Burch, Arthur, 5, Baring Crescent, Exeter.
- 1862 Cann, William, F.R.H.S., 9, Southernhay, Exeter.
 1866 Carpenter-Garnier, J., Mount Tavy, Tavistock.
 1870 Carrington, W. H., The Terrace, H.M. Dockyard, Devonport.
 1870 Carslake, J. B. H., Bridgewater.
 1864 Cawdle, W., 26, Union Street, Torquay.
 1866 Champernowne, A., M.A., F.G.S., Dartington House, Totnes.
 1866 Chanter, J. R., Fort Hill, Barnstaple.
 1871 Chanter, T. B., York House, Bideford.
 1871 Charlewood, Capt. E. P., R.N., Northam, Bideford.
 1869 Clark, R. A., Wentworth, Torquay.
 1871 Clements, Rev. H. G. J., M.A., Vicarage, Sidmouth.
 1870 Close, Rev. R., Grosvenor Villa, 204, Burrage Road, Plumstead, London. S.E.
 1871 Coffin, J. R. Pine, Portledge, Bideford.
 1871 Coffin, T., 4, Molesworth Terrace, Stoke, Devonport.
 1868 Coleridge, Rt. Hon. Sir J. T., LL.D., Heath's Court, Ottery St. Mary.
 1868*Coleridge, Sir J. D., M.A., M.P., 6, Southwick Crescent, London. W.
 1872 Colby, Rev. F. T., Regent's Terrace, Polsloe Road, Exeter.
 1866 Collier, W. F., Wood Town, Horrabridge.
 1871 Cook, Rev. Frederic Charles, M.A., Canon Residentiary of Exeter, The Close, Exeter.
 1868 Copleston, Rev. J. G., M.A., Offwell Rectory, Honiton.
 1867 Cotton, R. W., Barnstaple.
 1866 Cotton, W., Elms House, Alphington Road, Exeter.
 1870 Crabbe, William Richard, F.S.A., East Wonford, Heavitree, Exeter.
 1869 Cranford, R., Dartmouth.
 1866 Creed, J., Whiddon, Newton Abbot.
 1862 Cresswell, C. H., Heavitree Cottage, St. Julian's Road, Streatham, London. S.W.
 1872 Curgiven, Rev. F. H., M.A., East Southernhay, Exeter.
 1872 Cuthberston, W., Crossmead, Exeter.
- 1870 Dansey, G., M.D., Spurbarne, St. Leonards, Exeter.
 1871 Davis, Rev. S., Burrington, Chulmleigh.
 1871 Deane, W. A., Webbery, Bideford.
 1870 Delarue, P. F., M.R.C.S., 40, Ker Street, Devonport.
 1862 Divett, John, M.A., Bovey Tracey.

- 1867 Doe, G., Castle Street, Great Torrington.
 1864 Donne, B. J. M., Merifield, Torquay.
 1869*Douglas, Rev. R., M.A., Manaton, Moretonhampstead.
 1866 Drewe, E. S., The Grange, Honiton.
 1866 Durant, R., Sharpham, Totnes.
 1871 Dymond, F. W., 3, Manston Terrace, Exeter.
 1872 Dymond, R., Bamfylde House, Exeter.
- 1862 Elliott, W. H., M.D., Bouverie House, St. Leonards, Exeter.
 1862 Ellis, H. S., F.R.A.S., 1, Fair Park, Exeter.
 1872 Ellis, W., Hartwell House, Exeter.
 1869*Evans, J., F.R.S., F.S.A., F.G.S., Nash Mills, Hemel Hempstead, Herts.
 1871*Exeter, Right Rev. the Lord Bishop of, The Palace, Exeter.
- 1872 Falkner, Rev. Thomas Felton, Appleby Magna, Atherstone.
 1867 Farleigh, R., Barnstaple.
 1869 Farley, H. W., C.E., 3, Belmont Villas, Newton Abbot.
 1864 Finch, T., F.R.A.S., M.D., Westville, St. Mary Church, Torquay.
 1872 Flamank, J., 2, Grove Villas, Teignmouth.
 1872 Follet, C. J., Polsloe House, Exeter.
 1867 Fortescue, Right Hon. Earl, Castle Hill, Southmolton.
 1867 Foster, Rev. J. P., M.A., Dartmouth.
 1867 Fowler, H., Torrington.
 1863 Fox, S. B., 7, Southernhay, Exeter.
 1870 Freckleton, Rev. T. W., 30, Hill Park Crescent, Plymouth.
 1870 Froude, J. A., M.A., 5, Onslow Gardens, London. S.W.
 1868 Froude, W., M.A., F.R.S., M.I.C.E., Chelston Cross, Torquay.
 1872 Furdon, Rev. E., Furdon, Tiverton.
- 1862 Gamlen, W. H., Bramford Speke, Exeter.
 1872 Galton, J. C., 6, Dix's Field, Exeter.
 1872 Gaye, C., M.R.C.S., Newton Abbot.
 1872 Geare, J. G., Exeter.
 1871*Gervis, W. S., M.D., Ashburton.
 1872 Gidley, B. C., Bainfield, Exeter.
 1865 Gill, H. S., Tiverton.
 1867 Gill, J. H., Bickham Park, Roborough.
 1868 Goldsmid, J., M.A., M.P., 49, Grosvenor Street, London. W.
 1868 Gordon, C., M.A., Wiscombe Park, Honiton.
 1871 Gosset, Rev. J. H., M.A., The Priory, Westward Ho, Bideford.
 1869 Gould, G. D., Moretonhampstead, Exeter.
 1868 Grainger, Rev. G. Watts, M.A., Luppit Vicarage, Honiton.
 1871 Green, Gen. Sir E., Pillhead, Bideford.
- 1870 Haddy, Rev. J. P., 8, Home Park, Stoke, Devonport.
 1867*Hall, Townsend, M., F.G.S., Pilton, Barnstaple.

- 1862 Hamilton, A. H. A., M.A., President of the Exeter Naturalists' Club, Fairfield Lodge, Exeter.
- 1870 Harding, Col., Upcot House, Pilton, Barnstaple.
- 1871 Harding, Rev. J. L., M.A., Littleham Rectory, Bideford.
- 1872 Harding, J., Millbrooke, Exeter.
- 1868 Harper, J., L.R.C.P., Bear Street, Barnstaple.
- 1862 Harpley, Rev. W., M.A., F.C.P.S., Clayhanger Rectory, Tiverton.
- 1869 Hawker, Rev. Treasurer, M.A., Ideford Rectory, Chudleigh.
- 1868 Haycock, W. Hine, 4, College Hill, London, and Belmont, Sidmouth.
- 1869 Hayne, C. Seale, Kingswear Castle, Dartmouth.
- 1872 Hayward, J., Cathedral Yard, Exeter.
- 1872 Hayward, P., Cathedral Yard, Exeter.
- 1862 Hearder, G. E., Torwood Street, Torquay.
- 1862 Hearder, J. N., Ph.D., Union Street, Plymouth.
- 1865 Hearder, W., Roccombe, Torquay.
- 1868 Heberden, Rev. W., M.A., Broadhembury Vicarage, Honiton.
- 1871 Heineken, N. S., Sidmouth.
- 1871 Henwood, W. J., F.R.S., F.G.S., 3, Clarence Place, Penzance.
- 1872 Hill, J., J.P., Moretonhampstead, Exeter.
- 1862 Hine, J. E., F.I.B.A., Mulgrave Place, Plymouth.
- 1869 Hindston, R., Dartmouth.
- 1872 Hirtzell, G., Shillingford Lodge, Exeter.
- 1872 Hockley, A. R., Bidwell, Newton St. Cyrus.
- 1867 Hodgson, W. B., Professor, LL.D., 41, Grove End Road, London. N.W.
- 1871 Holderness, Rev. W., M.A., Woolfardisworthy, Bideford.
- 1867 Hore, Rev. W. S., M.A., Penrose Villas, Barnstaple.
- 1862 Horne, T. B., M.R.C.S., Adwell, Torquay.
- 1871 Hounsell, Dr., The Larches, Torquay.
- 1871 How, John, Bideford.
- 1872 Howard, Rev. W. H., Rectory, St. Thomas, Exeter.
- 1872 Hughes, Major-General W. T., C.B., Strete Raleigh, Whimple, Exeter.
- 1868* Hunt, A. R., M.A., Quintella, Torquay.
- 1868 Hutchinson, P. O., Sidmouth.
- 1869 Inskip, Rev. J., M.A., C.B., H.M.S. *Britannia*, Dartmouth.
- 1869 Johnson, A. C., H.M.S. *Britannia*, Dartmouth.
- 1862 Jones, Winslow, St. Loyes, Heavitree, Exeter.
- 1871 Jordan, W. R. H., Bitton Street, Teignmouth.
- 1866 Kelly, A., Kelly House, Milton Abbot, Tavistock.
- 1862 Kendall, W., J.P., 6, Higher Summerlands, Exeter.
- 1867 Kennaway, Sir John, Bart., M.A., Escot, Ottery St. Mary.
- 1872 Kennaway, J., M.A., 19, Oxford Square, London, W.; and Escott, Ottery St. Mary.

- 1868 Kensington, E. P., Mount Radford, Exeter.
 1868 Kingdon, A. S., M.D., Combmartin, Ilfracombe.
 1871 Kingsley, Rev. Canon, M.A., F.L.S., F.G.S., Eversley Rectory,
 Hants.
 1867 Kirwan, Rev. R., M.A., F.R.S.L., Gittisham Rectory, Honiton.
 1871 Kitchen, Rev. J. L., M.A., Grammar School, Bideford.
 1865 Kitson, W. H., 2, Vaughan Parade, Torquay.
- 1869*Laidley, Rev. W., M.A., West Lawn, Teignmouth.
 1871 Lake, W. C., M.D., 2, West Cliff Terrace, Teignmouth.
 1872 Lawless, J., Mount Radford, Exeter.
 1871 Lee, Godfrey Robert, Fore Street, Teignmouth.
 1872 Lee, J. E., F.G.S., F.S.A., Villa Syracuse, Torquay.
 1870 Lewis, J. D., M.D., Membrland Hall, Ivybridge.
 1872 Linford, W., Elston, Old Tiverton Road, Exeter.
 1868 Lingwood, R. M., M.A., F.L.S., F.G.S., Cheltenham.
 1872 Lloyd, Horace G., 9, Baring Place, Mount Radford, Exeter.
 1869 Luttrell, G. F., Dunster Castle, Somerset.
 1863*Lyte, F. Maxwell, Berry Head House, Brixham.
- 1865 Mackenzie, F., M.R.C.S., Tiverton.
 1870 Mackenzie, J. I., M.B., Belgrave, Sidmouth.
 1871 Marshall, H. T., The Cottage, Teignmouth.
 1871 Marshall, W., 10, Cornwall Street, Plymouth.
 1871*Martin, John May, C.E., F.M.S., Lower Musgrave House,
 Exeter.
 1870 May, J., M.R.C.S., J.P., 1, Nelson Villas, Devonport.
 1872 Mellish, E., The Lodge, Buckerell, Honiton.
 1867 Merrifield, J., LL.D., F.R.A.S., Gascoigne Place, Plymouth.
 1870 Metcalfe, Rev. J., M.A., Portland Villas, Plymouth.
 1862 Miles, W., Dix's Field, Exeter.
 1870 Mogg, W., 4, Stafford's Hill, Devonport.
 1871 Molesworth, Capt., R.N., Bideford.
 1870 Moore, A., H.M. Dockyard, Devonport.
 1862 Moore, W. F., The Friary, Plymouth.
 1872 Mortimer, W., 14, Bedford Circus, Exeter.
- 1864 Nankivell, C. B., M.D., Layton House, Torquay.
 1871 Narraway, John, Bideford.
 1872 Newman, J. F., 3, Queen Street Road, Exeter.
 1872 Newport, Rev. H., M.A., High Street, Exeter.
 1872 Nicholson, A. H., 7, Reed Vale, Teignmouth.
- 1872 Oliver, Capt., R.A., F.R.G.S., Citadel, Plymouth.
 1862 Ormerod, G. W., M.A., F.G.S., Brookbank, Teignmouth.
 1872 Oxland, Rev. W., B.A., 10, South Devon Place, Plymouth.
- 1871 Padley, Rev. C. J. A., Littleham, Bideford.

- 1862 Palk, Sir Lawrence, Bart., M.P., Haldon House, Torquay.
 1869*Pannel, C., F.G.S., Walton Lodge, Torquay.
 1862 Parfitt, Edward, Devon and Exeter Institution, Exeter.
 1867 Parry, J. A., Bideford.
 1871 Paty, G. P. H., M.A., Bideford.
 1872†Peach, Charles W., A.S.L., President R.P.S., Edinburgh, 30, Haddington Place, Leith Walk, Edinburgh.
 1872*Peek, H. W., M.P., Rousdon, Lyme, Dorset.
 1862 Pengelly, W., F.R.S., F.G.S., &c., Lamorna, Torquay.
 1864 Phillips, J., Devon Square, Newton Abbot.
 1867 Pick, Joseph Peyton, Braunton, Barnstaple.
 1862 Pollard, W., M.R.C.S., Southland House, Torquay.
 1868 Porter, W., M.A., Hembury Fort, Honiton.
 1868 Prideaux, Col. Sir Edmund S., Bart., Netherton Hall, Honiton.
 1871 Pridham, T. L., F.R.C.S., Hyefield, Bideford.
 1869 Prinsep, T. L., Kingswear, Dartmouth.
 1867 Prowse, A. P., Mannamead, Plymouth.
 1862 Pycroft, G., M.R.C.S., F.G.S., Kenton, Exeter.
 1871 Pyke, William, Bideford.
 1871 Pynsent, Thomas, Northam, Bideford.

 1869*Radford, I. C., 56, Fose Street, Devonport.
 1868*Radford, W. T., M.B., F.R.A.S., Sidmount, Sidmouth.
 1869 Rees, W. H., Dartmouth.
 1872 Reichel, Rev. Oswald J., B.C.L., Sparsholt, Wantage, Berks.
 1872 Richard, R. J., Higher Summerlands, Exeter.
 1870 Riddell, Major-General, C.B., M.A., Oaklands, Chudleigh.
 1869 Ridgway, Captain, 2, Waterloo Place, Pall Mall, London.
 1862 Ridgway, S. R., LL.D., M.A., Mount Dinham, Exeter.
 1862 Risk, Rev. J. E., M.A., St. Andrew's Chapelry, Plymouth.
 1871 Robin, John, Bishopsteignton, Teignmouth.
 1867 Rock, W. F., Hyde Cliff, Wellington Grove, Blackheath.
 1870 Rolston, J., M.D., Clarendon Villa, Stoke, Devonport.
 1870 Rolston, G. T., M.R.C.S., 59, Haddington Road, Stoke, Devonport.
 1862 Rooker, A., Mount View, Plymouth.
 1871 Rooker, James, Bideford.
 1870 Rooker, W. S., Bideford.
 1872 Rossell, J. H., 7, Dix's Field, Exeter.
 1865 Row, W. N., Cove, Tiverton.
 1862 Rowe, J. Brooking, F.L.S., Lockyer Street, Plymouth.
 1866 Russell, Right Hon. Earl, Chesham Place, London. S.W.
 1866 Russell, Arthur J. E., M.P., 10, South Audley Street, London.
 1869*Ryder, J. W. W., J.P., Devonport.

 1872 Sadler, Rev. Prebendary, Rectory, Honiton.
 1872 Sanders, Rev. Prebendary, Rectory, Sowton, Exeter.

- 1872 Sandford, Rev. E. G., Palace, Exeter.
 1869 Sanford, W. A., F.G.S., Nynehead Court, Wellington, Somerset.
 1871 Scoble, John, Northam, Bideford.
 1865 Scott, W. B., Chudleigh.
 1862 Scott, W. R., Ph.D., St. Leonards, Exeter.
 1871 Seymour, Rev. G., M.A., Kingswear, Dartmouth.
 1862 Shapter, T., M.D., Barnfield, Exeter.
 1862* Sheppard, A. B., The Hove, Torquay.
 1862 Shute, R., Baring Crescent, Exeter.
 1868 Sidmouth, Right Hon. Viscount, Upottery Manor, Honiton.
 1869* Sivewright, J., The Grove, Torquay.
 1871 Smale, Charles, Bideford.
 1869 Smart, Rev. J., Kingswear, Dartmouth.
 1872 Soyres, Rev. F. de, 13, Victoria Terrace, Mount Radford,
 Exeter.
 1864 Spragge, F. H., Torremont, Torquay.
 1864 Spragge, W. K., The Quarry, Paignton.
 1870 St. Aubyn, E., Nelson Villas, Stoke, Devonport.
 1868 Stebbing, Rev. T. R. R., M.A., Tor Crest Hall, Torquay.
 1869 Studdy, H., Wadeton Court, Brixham.
 1872 Style, S., 223, High Street, Exeter.
 1870 Swann, Capt. J. S., F.G.S., F.S.A., Holyshute, Honiton.

 1864*Tetley, J., M.D., Belmont, Torre, Torquay.
 1872 Thomas, H. D., 9, Dix's Field, Exeter.
 1872 Thomas, J. L., Newhayes, Alphington, Exeter.
 1868 Thornton, Rev. J. H., B.A., North Bovey Rectory, Moreton-
 hampstead.
 1870 Timins, Colonel, Newstead, Torquay.
 1872 Tozer, E., Eagle House, Heavitree, Exeter.
 1872 Tozer, Henry, Ashburton.
 1869 Tothill, W., Stoke Bishop, Bristol.
 1871 Trevelyan, Sir Walter C., Bart., M.A., F.G.S., Wallington,
 Newcastle-on-Tyne.
 1872 Tucker, C., Marlands, Exeter.
 1872 Tucker, J. T., 3, Barnfield, Exeter.
 1865 Turnbull, A., Parkwood, Torquay.
 1872 Turnbull, Lieut-Col. J. R., The Priory, Torquay.

 1870 Vallack, C., 5, St. Michael's Terrace, Stoke, Devonport.
 1872 Varwell, P., Alphington Street, St. Thomas, Exeter.
 1869 Vicary, R., Dyrons, Newton Bushel.
 1862* Vicary, W., F.G.S., The Priory, Colleton Crescent, Exeter.
 1871 Vidal, E. U., Cornborough, Bideford.
 1862 Vivian, E., M.A., F.M.S., &c., President of the Teign Naturalists'
 Field Club, Woodfield, Torquay.
 1864 Vivian, R. H. D., Woodfield, Torquay.
 1870 Wade, Seaton, Staff-Surgeon H.M.S. *Impregnable*, Devonport.

- 1864 Weeks, C., 83, Union Street, Torquay.
 1870 Were, T. K., M.A., Cottlands, Sidmouth.
 1866* Weymouth, R. F., D. Lit., M.A., Mill Hill, Middlesex. N.W.
 1872† Whitaker, W., B.A., F.G.S., Geological Survey Office, 28, Jermyn Street, London. S.W.
 1870 Whitley, N., Penarath, Truro.
 1867 White, Richard, Instow, Barnstaple.
 1864 White, J. T., 7, Scarborough Terrace, Torquay.
 1871 Whiteway, J. H., Brookfield, Teignmouth.
 1871 Wickham, T. T., High Street, Bideford.
 1872 Wilcocks, H., Spurbarn, St. Leonards, Exeter.
 1872 Wilkinson, R. C., Isca, Torquay.
 1871 Willett, Capt. J. S., Monkleigh, Torrington.
 1871 Wills, Joseph, West Quarter, Exeter.
 1866 Windeatt, John, 9, Brunswick Terrace, Plymouth.
 1866 Windeatt, Thomas, Tavistock.
 1872 Windeatt, T. U., Totnes.
 1872* Winwood, Rev. H. H., M.A., F.G.S., 11, Cavendish Crescent, Bath.
 1872 Worth, R. N., *Western Morning News* Office, Plymouth.
 1870 Wren, A. B., Lenwood, Bideford.

The following Table shows the progress and present state of the Association with respect to the number of Members.

	Honorary.	Corresponding.	Life.	Annual.	Total.
August 17th, 1871 ..	1	..	19	263	283
Since elected	1	2	5	62	70
Since deceased	1	6	7
Since withdrawn	24	24
Since erased	28	28
August 1st, 1872 ..	1	2	24	267	294

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